

# CONFERENCE ABSTRACTS

## ICSPS 2019

2019 11th International Conference on

Signal Processing Systems

## Workshop

## ICFST 2019

2019 3rd International Conference on

Frontiers of Sensors Technologies

Chengdu, China | November 15-17, 2019

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Dear professors and distinguished delegates,

It is indeed a pleasure to welcome you to 2019 11th International Conference on Signal Processing Systems (ICSPS 2019) and 2019 3rd International Conference on Frontiers of Sensors Technologies (ICFST 2019) being held in the beautiful city of Chengdu, China.

We are pleased to have accepted 54 presentations out of 79 papers. On November 16, these presentations are divided into five parallel sessions and one poster session: Signal Acquisition and Analysis, Signal Detection and Processing, Image Processing Technology and Method, Electronics and Communication Engineering and Advanced Electronic Technology and Sensor Applications. One best presentation will be selected from each parallel session, evaluated from: Originality, Applicability, Technical Merit, Visual Aids, and English Delivery. Wishing you all the very best of luck with your presentations!

A word of special welcome is given to our keynote speakers, Prof. Robert Minasian from The University of Sydney, Australia, Prof. Cheng Li from Memorial University of Newfoundland, Canada, Prof. Ho Pui, Aaron HO from The Chinese University of Hong Kong, and invited speakers, Prof. Kunbao Cai from Chongqing University, China, and Prof. Haiquan Zhao from Southwest Jiaotong University, China as well as all the authors who are pleased to make contributions to our conference and share their new research ideas with us. And we wish to express our sincere appreciation to all the Advisory Chair, Conference General Chair, Conference Co-chair, Organizing Chair, Program Chair and Technical Committee.

We believe that by this excellent conference, you can get more opportunity for further communication with researchers and practitioners with the common interest in signal processing systems and frontiers of sensors technologies fields.

Our wish is that you will enjoy this conference, contribute effectively toward it and take back with you knowledge, experiences, contacts and happy memories of this conference.

Yours sincerely,

Conference Chair

Prof. Kezhi Mao

Nanyang Technological University, Singapore



## Notes:

- ✧ You are welcome to collect conference materials at any working time during the conference.
- ✧ Please kindly keep your Paper ID in mind so that the staff can quickly locate your registration information onsite.
- ✧ Certificate of Listener can be collected at the registration counter. Certificate of Presentation will be awarded after your presentation by the session chair.
- ✧ One Best Presentation will be selected from each parallel session and the author of best presentation will be announced and awarded at the closing ceremony.
- ✧ Your punctual arrival and active involvement in each session will be highly appreciated.
- ✧ Please kindly make your own arrangements for accommodations.
- ✧ Please keep all your belongings (laptop and hand phone etc.) with you in the public places, buses, metro. Conference organization is not responsible for the loss or damage of any valuables of the attendees.
- ✧ Wearing your name tag when you enter the meeting room.
- ✧ Name tag is not allowed to borrow to irrelevant persons.
- ✧ Do not bring irrelevant persons into the meeting room.
- ✧ Please copy your PPT to the computer on November 15 or in the morning of November 16 at the registration table. The size of PPT is 16:9.

## Warm Tips for Oral Presentation:

- ✧ Get your presentation PPT files prepared.
- ✧ Regular oral presentation: 15 minutes (including Q&A).
- ✧ Laptop, projector & screen, laser sticks will be provided by the conference organizer.

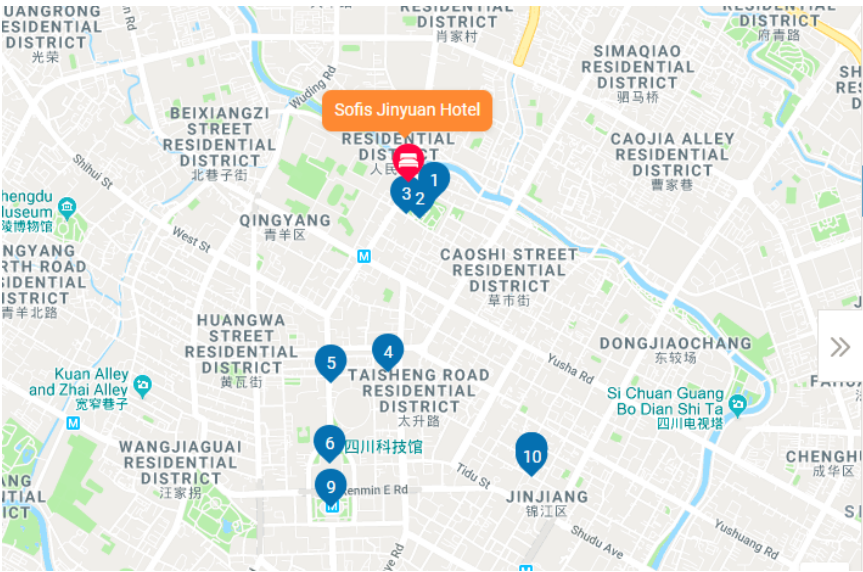
Sofis Jinyuan Hotel

成都索菲斯锦苑宾馆

Add: No.22, Section 3 of Renmin Middle Road Chengdu China  
地址：四川省·成都市·青羊区人民中路三段 22 号(文殊院地铁站)  
Reservation Tel.: 13880723392 | 预订电话：13880723392

Ideally located at the center of Chengdu, Sofis Jinyuan Hotel is close to Wenshu Monastery. Chunxi Road and Kuan Zhai Alley are a 10-minute drive away. Sofis Jinyuan Hotel takes 6 minutes by taxi to Chengdu North Railway Station. Chengdu Shuangliu International Airport is a 30-minute drive away.

成都索菲斯锦苑宾馆位于成都市青羊区人民中路三段，交通便利，地理优越，不仅坐拥天府成都繁华 CBD 中心，且毗邻成都市中央休闲旅游区、中国著名的千年佛教圣地——文殊院。



Places of Interest

1	WenShuFang Folk and Culture Street	240 m
2	Wenshuyuan	240 m
3	Wuzhufang	510 m
4	Meet the Nordic Illusion Art Museum	1.26 km
5	ChengDuShi ChengXiang GuiHua ZhanLanGuan	1.46 km
6	Sichuan Science and Technology Museum	1.99 km
7	Jinjiang Theatre	2.15 km
8	Sichuan Opera Museum	2.15 km
9	Mystery of Life Museum	2.19 km
10	See the legendary "Furong Guocui" Bian Lian show.	2.19 km

## How to get to **Sofis Jinyuan Hotel** from **Chengdu Shuangliu International Airport**?


- The fastest way: **Taxi**



Taxi-----Around 40 minutes-----Around 60 RMB

- The economical way: **Metro**



Metro line 10+Metro line 3+Metro line 1+  Walking

Around 50 minutes-----Around 6 RMB

Get on the **Metro line 10** at **Shuangliu airport station** (4 stations)

成都双流机场乘坐 10 号线 （途经 4 个站）



Get off at **Taipingyuan Station**, and then get on the **Metro line 3** (4 stations)

太平园站乘坐 3 号线 （途经 4 个站）



Get off at **Sichuan Gymnasium Station**, and then get on the **Metro line 1** (5 stations)

省体育馆乘坐 1 号线 （途经 5 个站）



Get off at **Wenshuyuan Station**, and then exit from **K Gate**

文殊院站下车



Walk to **Sofis Jinyuan Hotel**

步行到索菲斯锦苑宾馆

## Hotel Nearby:

- Dorsett Grand Hotel Chengdu | Tel.: 400-699-8818

成都帝盛君豪酒店 | 电话: 400-699-8818

Add.: 168 West Yulong Street (Xi Yulong Jie)

地址: 成都青羊区西玉龙街168号（和小福建营巷交汇处）

- **Buddha Zen Hotel Chengdu** | Tel.: 028-86929898  
成都圆和圆佛禅客栈 | 电话: 028-86929898  
Add.: B6-6, Wenshufang Street (Wenshu Fang), Qingyang District(B6-6)  
地址: 文殊坊B6-6号院, 近银丝街
  - **Atour Hotel Chengdu Chunxi Road Branch** | Tel.: 028-82120666  
成都春熙路亚朵酒店 | 电话: 028-82120666  
Add.: Near Sichuan Baoye Building No. 70 Hongxing Road 2nd Section  
地址: 成都锦江区红星路二段70号
- 



## TIPS:



### Weather

High Temperature: 15°C | Low Temperature: 9°C



### Time Zone

GMT+8



### Currency

Chinese RMB



### Important Phone Numbers

Emergency Ambulance & Fire: 119


Emergency Ambulance: 120

Police Emergency: 110

# AGENDA AT A GLANCE

Chengdu, China | November 15-17, 2019

## < November 15, 2019, Friday >

 <b>Lobby on the first floor</b>	
10:00-17:00	Onsite Registration & Conference Materials Collection

## < November 16, 2019, Saturday > Morning


 <b>Tianfu Meeting room   First floor (天府厅   一楼)</b>		
<b>Chair: Prof. Kezhi Mao, Nanyang Technological University, Singapore</b>		
09:00-09:05	<b>Opening Remark</b>	<b>Assoc. Prof. Letian Huang</b> University of Electronic Science and Technology of China, China
09:05-09:45	<b>Keynote Speech I</b>	<b>Prof. Robert Minasian (IEEE &amp; OSA Fellow)</b> The University of Sydney, Australia Speech Title: Microwave Photonic Signal Processing and Sensing
09:45-10:10	 <b>Coffee Break &amp; Group Photo</b> 	
	<b>Poster Presentations</b>	PF1011, PF1021, PF1031, PF1034, PF1042
10:10-10:50	<b>Keynote Speech II</b>	<b>Prof. Cheng Li</b> Memorial University of Newfoundland, Canada Speech Title: Energy-efficient Coordination Schemes for Underwater Acoustic Sensor Networks
10:50-11:30	<b>Keynote Speech III</b>	<b>Prof. Ho Pui, Aaron HO (SPIE Fellow)</b> The Chinese University of Hong Kong, Hong Kong Speech Title: Surface Plasmon Resonance in Metallic Nano-structures: Sensing, Optofluidics and Optoelectronics
11:30-12:00	<b>Invited Speech I</b>	<b>Prof. Kunbao Cai</b> Chongqing University, China Speech Title: Transforms of Multiwavelet and Multiwavelet Packet with Application in Identifying Heroin Addict Pulse Signals



**Lunch @Restaurant | First Floor<12:00-13:00>**







## < November 16, 2019, Saturday > Afternoon

 <b>Sichuan Meeting room   Second floor (四川厅   二楼)</b>		
<b>Chair: Prof. Kezhi Mao, Nanyang Technological University, Singapore</b>		
13:00-13:40	<b>Invited Speech II</b>	<b>Prof. Haiquan Zhao</b> Southwest Jiaotong University, China Speech Title: Research on Adaptive Filtering Algorithm Based on Total Least Square Method

## < November 16, 2019, Saturday > Afternoon



### Parallel Sessions

 <b>Sichuan Meeting room   Second floor (四川厅   二楼)</b>	
13:50-16:20	<b>Session I-Part A-Signal Acquisition and Analysis</b> <b>10 Presentations</b>
	PF1032, PF1048, PF2002, PF1041, PF1012, PF1022, PF1028, PF1033, PF1039, PF1044
 <b>Coffee Break &lt;16:20---16:35&gt;</b>	
16:35-17:20	<b>Session I-Part-B-Signal Acquisition and Analysis</b> <b>3 Presentations</b>
	PF1049, PF1007, PF1016

 <b>Guizhou Meeting room   Second floor (贵州厅   二楼)</b>	
13:50-16:20	<b>Session II-Electronics and Communication Engineering</b> <b>10 Presentations</b>
	PF1010, PF1045, PF1015, PF1023, PF1024, PF1046, PF1029, PF4004, PF1003, PF1025
 <b>Coffee Break &lt;16:20---16:35&gt;</b>	
16:35-18:35	<b>Session III-Signal Detection and Processing</b> <b>8 Presentations</b>
	PF1014, PF2001, PF1053, PF3006, PF1004, PF1026, PF1055, PF3009

# AGENDA AT A GLANCE

Chengdu, China | November 15-17, 2019

 <b>Yunnan Meeting room   Second floor (云南厅   二楼)</b>	
13:50-16:20	<b>Session IV-Advanced Electronic Technology and Sensor Applications</b> <b>10 Presentations</b>
	PF3005, PF3007, PF3008, PF3011, PF3015, PF4001-A, PF4003-A, PF3012, PF3014, PF1054
 <b>Coffee Break &lt;16:20---16:35&gt;</b>	
16:35-18:35	<b>Session V-Image Processing Technology and Method</b> <b>8 Presentations</b>
	PF1018, PF1019, PF1027, PF1050, PF1051, PF1005, PF1006, PF1009



**Closing Ceremony & Best Presenter Awarding | Sichuan Meeting Room <18:40-19:00>**



**Dinner@Restaurant | Sichuan Meeting Room | First Floor <19:00-20:30>**

## <November 17, 2019, Sunday>

### SOCIAL EVENT

The Chengdu Panda Breeding Research Center (熊猫基地)—Kuanzhai Alley (宽窄巷子)—Chengdu People's Park (成都人民公园)—Sofis Jinyuan Hotel (索菲斯锦苑宾馆)

#### Note:

1. Gather point: The lobby of Sofis Jinyuan Hotel (08:30am)
2. Participants need to sign up by November 10. If the participants are less than 6 persons, the social event will be cancelled.
3. **Inclusions:** traffic, lunch, travel accident insurance and professional English guide  
**Exclusion:** drinks



The **Chengdu Panda Breeding Research Center** has been created and imitated the pandas' natural habitat in order that they might have the best possible environment for rearing and breeding. The Research Center covers an area of 560 mus (92 acres), 96% of which is verdure. Giant pandas, lesser pandas, black-necked cranes, white storks as well as over 20 species of rare animals are fed and bred there throughout the year.



Being in the list of Chengdu Historical and Cultural Protection Project, **Kuanzhai Alley** is composed of broad alley, narrow alley and across alleys, among which, there are a lot of traditional courtyards, or siheyuan.

According to documents, officers lived in those broad alleys, while the Eight Flag members lived in a narrow alley that was parallel to the broad one.



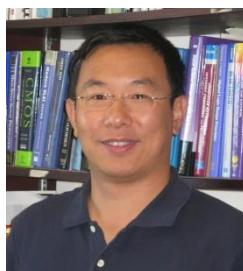
Located in Shaocheng Road, Yutang Street, Chengdu, **Chengdu People's Park** covers an area of 112,639 square meters. It is a comprehensive garden integrating cultural relics and leisure. The park was built in 1911. The park has famous tourist attractions such as Jinshui River, Jinyu Island and Bonsai Garden.



**Prof. Robert Minasian (IEEE & OSA Fellow)**  
**The University of Sydney, Australia**

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Professor Minasian is a Chair Professor with the School of Electrical and Information Engineering at the University of Sydney, Australia. He is also the Director of the Fibre-optics and Photonics Laboratory. His research has made key contributions to microwave photonic signal processing. He is recognized as an author of one of the top 1% most highly cited papers in his field worldwide. Professor Minasian has contributed over 370 research publications, including Invited Papers in the IEEE Transactions and Journals, and Plenary and Invited papers at leading international conferences. Professor Minasian was the recipient of the ATERB Medal for Outstanding Investigator in Telecommunications, awarded by the Australian Telecommunications and Electronics Research Board. He is a Life Fellow of the IEEE, and a Fellow of the Optical Society of America.



**Prof. Cheng Li**  
**Memorial University of Newfoundland, Canada**

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Prof. Cheng Li received the B.Eng. and M.Eng. degrees from the Harbin Institute of Technology, Harbin, China, and the Ph.D. degree in electrical and computer engineering from Memorial University, St. John's, NL, Canada, in 1992, 1995, and 2004, respectively. He is currently a Full Professor and the Head of the Department of Electrical and Computer Engineering, Faculty of Engineering and Applied Science, Memorial University. His research interests include ad hoc and wireless sensor networks, wireless communications and networking, underwater communications and networks, switching and routing, and broadband communication networks, where he has contributed close to 300 research articles. He is a Registered Professional Engineer in Canada and a Senior Member of the IEEE and its Communications, Computer, Ocean Engineering, and Vehicular Technology Societies. He received the Best Paper Award at the ADHOCNETS 2018, the IEEE Globecom 2017, and the IEEE ICC 2010. He is an Editorial Board member of Wiley Wireless Communications and Mobile Computing, the Journal of Networks, KSII Transactions on Internet and Information Systems, and an Associate Editor of Wiley Security and Communication Networks. He has served as the General Co-Chair for the 2019 International Conference on Artificial Intelligence for Communications and Networks (AICON), and the International Conference on Wireless Networks and Mobile Communications (WINCOM) in 2019 and 2017. He has served as a Technical Program Committee Co-Chair for the 2020 International Conference on Computing, Networking, and Communications (ICNC), 2019 International Conference on Ad Hoc Networks (ADHOCNETS), 2017 Wireless Internet Conference (WiCON), the Annual International Conference on Modeling, Analysis, and Simulation of Wireless and Mobile Systems in 2013 and 2014, the International Conference on Wireless and Mobile Computing, Networking, and Communications in 2011, and the Biennial Symposium on Communications in 2010. He has also served as the Co-Chair for various technical symposia or tracks of many international conferences, including the IEEE ICC and GLOBECOM, International Conference on Communications, the Wireless Communications and Networking Conference, the Vehicular Technology Conference, and International Wireless Communications and Mobile Computing Conference.



**Prof. Ho Pui, Aaron HO (SPIE Fellow)**  
**The Chinese University of Hong Kong**

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Prof. Ho received his BEng and PhD in Electrical and Electronic Engineering from the University of Nottingham. Currently a professor in the Department of Biomedical Engineering, The Chinese University of Hong Kong (CUHK), he has been with the Department of Electronic Engineering and held positions as Associate Dean of Engineering, CUHK; Assistant Professor in Department of Physics and Materials Science, City University of Hong Kong; Senior Process Engineer for semiconductor laser fabrication in Hewlett-Packard. His service to the professional and academic community includes Chairman of Hong Kong Optical Engineering Society; Chairman of IEEE Electron Device/Solid-State Circuits (ED/SSC) Hong Kong Chapter, Admission Panel member of Technology Business Incubation Programme (IncuTech) operated by Hong Kong Science and Technology Parks Corporation (HKSTP); Council Member of The Technological and Higher Education Institute of Hong Kong (THEi). Started as a compound semiconductor materials scientist, his current academic interests focus at nano-sized semiconductor materials for photonic and sensor applications, optical instrumentation, surface plasmon resonance biosensors, lab-on-a-chip and biophotonics. He has published over 400 peer-reviewed articles, 33 Chinese and 6 US patents. He is a Fellow of SPIE and HKIE.



**Prof. Kunbao Cai**  
**Chongqing University, China**

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Prof. Kunbao Cai was born in Shanghai City of China, in 1950. He graduated from the Department of Electrical Engineering, Shanghai Jiao Tong University, China, in 1978, and received the M.Eng. degree in 1983 and the Ph.D. degree in 1998, all in electrical engineering, from Chongqing University, China.

From 1978 to 1980, he assisted teaching in the Electronic Department, Shanghai Jiao Tong University. From 1991 to 1994, he assisted researching on signal processing and system identification, and then studied, in the Department of Biomedical Engineering, McGill University, Canada. He held the following teaching and research positions in Chongqing University: Teaching Assistant, 1983-1986; Lecturer of Electrical Engineering, 1986-1994; Associate Professor of Electrical Engineering, 1994-2000; Full Professor of Electrical Engineering, from 2000. He retired from Chongqing University in 2015.

His major research interests include digital signal processing, biomedical signal processing, and artificial neural network with application to biomedical engineering. He is the author of textbooks: Digital Signal Processing (English Editions I and II), Publishing House of Electronics Industry, Beijing, China, (2007 and 2011). He completed a number of teaching research projects: Chongqing municipal excellent course of Signals and Linear Systems (from 2006), appointed as a Chief Prof.; Chongqing municipal excellent course of Digital Signal Processing (from 2008), appointed as a main Prof.; national bilingual teaching demonstration course of Signals & Systems (from 2010), appointed as a Chief Prof. Also he received a number of awards at Chongqing University for excellent teaching and textbook publications.





**Prof. Haiquan Zhao**  
**Southwest Jiaotong University, China**

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Prof. Haiquan Zhao (IEEE Senior Member) was born in Henan Province, China, in 1974. He received the B.S. degree in applied mathematics in 1998, the M.S. degree and the Ph.D degree in signal and information processing all at Southwest Jiaotong University, Chengdu, China, in 2005 and 2011, respectively. Since August 2012, he was a Professor with the School of Electrical Engineering, Southwest Jiaotong University, Chengdu, China. From 2015 to 2016, as a visiting scholar, he worked at University of Florida, USA. His current research interests include nonlinear active noise control, information theoretical learning, neural networks, adaptive network, adaptive filtering algorithm, adaptive Volterra filter, Kernel adaptive filter, and nonlinear system identification. At present, he is the author or coauthor of more than 130 international journal papers (SCI indexed), and the owner of 70 invention patents.

Prof. Zhao has served as an active reviewer for several IEEE Transactions, IET series, Signal Processing, and other international journals. Now, he was an AE of IEEE Access, and an Editorial board member of AEU- International Journal of Electronics and Communications.



## **Opening Ceremony & Keynote Speeches & Invited Speeches**

< November 16, 2019, Saturday >

Time: 9:00-12:00 & 13:00-13:40

Venue: Tianfu Meeting room (天府厅)

&


Sichuan Meeting room (四川厅)

***Chair: Prof. Kezhi Mao***

***Nanyang Technological University, Singapore***

# SCHEDULE

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09:00-09:05	<p><b>Opening Remark</b></p> <p><b>Assoc. Prof. Letian Huang</b> University of Electronic Science and Technology of China, China</p>
09:05-9:45	<p>Microwave Photonic Signal Processing and Sensing</p> <p><b>Prof. Robert Minasian</b> The University of Sydney, Australia</p> <p>Abstract-Photonic signal processing offers the prospect of overcoming a range of challenging problems in the processing of high-speed signals. Its intrinsic advantages of high time-bandwidth product and immunity to electromagnetic interference (EMI) have led to diverse applications. Photonic signal processing leverages the advantages of the optical domain to benefit from the wide bandwidth, low loss, and natural EMI immunity that photonics offers. Next generation global telecommunication platforms and emerging applications in radar, communications and sensing will require entirely new technologies to address the current limitations of electronics for massive capacity and connectivity. Microwave photonics, which merges the worlds of RF and photonics, shows strong potential as a key enabling technology to obtain new paradigms in the processing of high speed signals that can overcome inherent electronic limitations. In addition, the growth of silicon photonics allows integration together with CMOS electronics, to obtain future signal processing systems that can implement high bandwidth, fast and complex functionalities. Recent advances in microwave photonic signal processing are presented. These includes versatile beamforming and beam steering systems for phased array antennas, single bandpass microwave photonic filters, photonic-assisted scanning receivers for microwave frequency measurement, and microwave photonic sensing systems. These microwave photonic processors provide new capabilities for the realisation of high-performance signal processing and sensing.</p>
<p style="text-align: center;">             Coffee Break &amp; Group Photo            9:45---10:10         </p>	
10:10-10:50	<p>Energy-efficient Coordination Schemes for Underwater Acoustic Sensor Networks</p> <p><b>Prof. Cheng Li</b> Memorial University of Newfoundland, Canada</p> <p>Abstract-Underwater acoustic sensor networks (UWSNs) have attracted much research interest in recent years due to the wide range of their potential applications, such as environmental monitoring, natural resources development, and geological oceanography. While much research effort has been devoted to the improvement of acoustic signal reception and processing, the increase of throughput, and the reduction</p>

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	<p>of packet delay, few studies focus on reducing and balancing energy consumption among sensor nodes in long-term marine monitoring applications.</p> <p>In this work, through a comprehensive understanding of the underwater acoustic channels, a series of solutions have been proposed to achieve energy-efficient data transmission in UWSNs by considering both battery energies of sensor nodes and network connectivity. The talk begins with the investigation of different approaches to modelling the underwater acoustic channels to obtain a comprehensive understanding of the underwater acoustic communication environment. An asynchronous wake-up scheme based on combinatorial designs to minimize the working duty cycle of sensor nodes is proposed for UWSNs in long-term marine monitoring applications. Network connectivity can be maintained using such a design, even with a reduced duty cycle. Performance evaluation show that the proposed asynchronous wake-up scheme can effectively reduce the energy consumption for idle listening and can outperform other cyclic difference set (CDS)-based wake-up schemes.</p> <p>The deployment strategy of UWSNs to balance the network robustness and the energy consumption of sensor nodes is also studied. The relay node selection scheme is evaluated in terms of network sizes and using different initial battery energy to balance the network lifetime. The results show that the proposed relay node selection scheme can effectively balance and prolong the network lifetime and its performance is closer to the optimal theoretical value obtained by solving the linear programming problem.</p> <p>Finally, an effective coordination scheme for data collection is studied when an autonomous underwater vehicle (AUV) is used as a mobile data sink in UWSNs. The effectiveness of the proposed scheme is studied when time synchronization does not exist between the AUV and the sensor nodes. Transmitting power control is jointly considered to further reduce energy consumption. It has been shown that proper power control mechanism can lead to lower energy consumption than without power control during underwater communication.</p>
10:50-11:30	<p>Surface Plasmon Resonance in Metallic Nano-structures: Sensing, Optofluidics and Optoelectronics</p> <p><b>Prof. Ho Pui, Aaron HO</b></p> <p>The Chinese University of Hong Kong, Hong Kong</p> <p>Abstract-Surface plasmons have been widely studied in many branches of physical sciences because of their unique properties associated with electromagnetic radiation-induced free electron movements. Surface plasmon resonance (SPR), in particular, which is well-known for the generation of highly localized energy intensity in the nanoscale, has been investigated for various applications including sensing and nanophotonics.</p> <p>SPR biosensors typically measures the shifts in resonance, which may take the form of</p>

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	<p>intensity dip, spectral absorption or optical phase jump, when target molecules are being captured and immobilized at the sensor surface. Among them, the SPR phase has been shown to be most sensitive for detecting target molecules. Various interferometer configurations have been reported to improve the resolution limit of SPR biosensors. Amongst them the spectral-phase interferometer has been shown to be most promising.</p> <p>SPR absorption also results in strong ohmic heating. A focused laser beam may induce highly localized hotspot through plasmonic absorption in gold nano-islands. Temperature gradient-induced trapping, guided optofluidic flow and valving are readily achievable. By varying the incident power density, which in turn changes the temperature within the hot spot, one can readily perform a sequence of operations on living cells including trapping, cell lysis and DNA amplification. This approach opens the possibility of a performing genetic diagnosis from a small cluster of cells purely through laser irradiation.</p> <p>Plasmonic localization also enhances the performance of gas sensors through a “catalytic” process by altering the carrier injection mechanism on the surface of the sensor material. This leads to the use of photon energy instead of conventional heating for gas sensing activation. We have demonstrated a room-temperature gas sensor scheme activated by plasmonic absorption in nano-sized metallic structures. By decorating gold nanoparticles (Au NPs) on the surface of ZnO NTPs through a physical evaporation process, we have incorporated localized surface plasmon resonance (LSPR) at the surface of the ZnO NTPs. The presence of LSPR has lowered the photon energy requirement for achieving light activation. In our experiments, the sensing response at 500 ppm ethanol has been improved from 5.5 to 62, i.e. an enhancement of over 10 times. We also observed improved sensing performance for other common organic vapors such as formaldehyde, acetone and methanol.</p>
11:30-12:00	<p>Transforms of Multiwavelet and Multiwavelet Packet with Application in Identifying Heroin Addict Pulse Signals</p> <p><b>Prof. Kunbao Cai</b> Chongqing University, China</p> <p>Abstract- It is well known that the multiwavelets are a natural generalization of the scalar wavelets and can be viewed as vector-valued wavelets which have several advantages in comparison to scalar wavelets. Correspondingly, the multiwavelet transforms can provide more adaptive to satisfy the requirements of a variety of signal analysis. On the other hand, the multiwavelet transforms have also a fast computational structure for multiresolution analysis, which can be viewed as a generalization of the fast algorithm of Mallat’s multiresolution analysis for the case of scalar discrete wavelet transforms. However, while using the Mallat’s multiresolution</p>

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	<p>analysis method to realize a multiwavelet transform, only the decomposed lowpass component at a decomposition stage is further decomposed, and the highpass component is left unchanging further. Therefore, the multiwavelet transforms can not supply finer time-frequency localized information for high frequency component obtained at every decomposition stage. Naturally, the concept of wavelet packet transforms was introduced into the multiwavelet transforms, which led to the so-called multiwavelet packet transforms. Thus, both the lowpass and highpass components at any decomposition stage can be further decomposed, with the result that any finer degree of the time-frequency localization can be obtained. It is really a great interesting to explore the effectiveness of these two modern signal processing techniques in identifying heroin addict pulse signals. In the research, the transforms of multiwavelet and multiwavelet packet are, respectively, used to decompose pulse signals collected from 15 heroin addicts and 15 healthy normal subjects. Combining entropy techniques in the feature extraction, the extracted feature vectors have good distributive properties in feature plane. To obtain a good generalization for classification of two classes of pulse signals, the support vector machine is introduced. It is expected to receive good research results.</p>
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**Lunch Time <12:00-13:00>**

**Note:** lunch coupon is needed for entering the restaurant.

**Venue: Sichuan Meeting room (四川厅)**

13:00-13:40	<p>Research on Adaptive Filtering Algorithm Based on Total Least Square Method</p> <p><b>Prof. Haiquan Zhao</b></p> <p>Southwest Jiaotong University, China</p> <p>Abstract- For linear systems, the conventional LS approach is a well-known solution to estimate the unknown system vector, which has been proposed under the assumption that the input signal has been observed without noises and noises are confined to the output signal of the system. However, this model assumption is sometimes not realistic due to the existence of sampling errors, human errors, and instrument errors. Moreover, the signals are disturbed by impulsive noises, which exist in many real world situations, the performance of the TLS algorithms based on EIV model will deteriorate seriously. In an attempt to improve the robustness of the TLS approach in non-Gaussian noise environments, several modified TLS algorithms were discussed to deal with the impulsive noise.</p>
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## Session I: Signal Acquisition and Analysis

< November 16, 2019, Saturday > Afternoon

Time: 13:50-17:20

Venue: Sichuan Meeting room (四川厅)

***Chair: Prof. Kunbao Cai***

***Chongqing University, China***

13 Presentations: PF1032, PF1048, PF2002, PF1041, PF1012, PF1022,  
PF1028, PF1033, PF1039, PF1044, PF1049. PF1007, PF1016

### **Note:**

- ✧ Please copy your PPT to the computer on November 15 or in the morning of November 16 at the registration table. The size of PPT is 16:9.
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- ✧ Certificates of Presentations will be awarded to each presenter by the session chair when the session is over.
- ✧ One Best Presentation will be selected from each parallel session and the author of Best Presentation will be announced and awarded at the closing ceremony.

<p>PF1032 13:50-14:05</p>	<p>Multiple Modules Speech Enhancement in Mixed Noise and Low SNR Environments <i>Tian Lan, <b>Wenzheng Ye</b>, Guoqiang Hui, Sen Li and Qiao Liu</i> University of Electronic Science and Technology of China, China</p> <p>Abstract—Achieving stationary speech enhancement in low signal-to-noise ratio (SNR) environments is a challenging problem. Because noise energy is dominant in noisy speech at low SNR level, the existence of numerous obvious random noises may lead neural network to forget some useful information obtained by early training. Moreover, it is difficult for a single neural network to obtain effective speech features and noise features. Therefore, this paper designs to utilize multiple neural networks in two stages to discriminately learn a certain type of noise features and reduce the introduction of interference. Experiment results demonstrate that proposed method leads to consistently better source-to-distortion ratio (SDR) and perceptual evaluation of speech quality (PESQ) than baseline models in low SNR condition. And the results indicate that the method can suppress the forgetting of early information of neural network.</p>
<p>PF1048 14:05-14:20</p>	<p>The Influences and Modification on the Fidelity of Vessel Radiated Noise Power Spectrum by Main-beam Width of Measurement Array <i><b>Wang Yang</b>, Li Gui-juan and Liu Yan-sen</i> Science and Technology on Underwater Test and Control Laboratory, China</p> <p>Abstract—In the question of the impact of the main-beam width on vessel radiated noise power spectrum characteristics, a typical mathematical model was established, the influence of the main-beam covering vessel and its trajectory on the acquisition of vessel radiation noise power spectrum characteristics is studied. Theoretical and simulation results show that when main-beam cannot cover the vessel and its trajectory, the method of multi-beam synthesis should be apply in order to undistorted acquire the vessel radiation noise power spectrum characteristic. A cargo-ship radiated noise characteristics is acquired based on the method of multi-beam synthesis in this paper, the difference of broadband sound pressure level acquired by beamforming and single hydrophone is less than 1.8dB. The research results can provide a basis and example for the effective acquisition of vessel radiated noise characteristics based on acoustic measurement array.</p>
<p>PF2002 14:20-14:35</p>	<p>Feature Extraction and Classification of UAV's Acoustic Signal Using 4-microphones Array in a Real Noisy Environment <i><b>Saad Ur Rehman</b> and Muhammad Amjad Iqbal</i> Nanjing University of Science and Technology, China</p> <p>Abstract—The importance of Unmanned Arial Vehicle (UAV) has made progressive usage in recent times due to ease of availability and miniaturization. While on another hand, it might pose a malicious effect on public safety, so the most important problem to be addressed is the recognition of drones in sensitive areas. This paper addressed</p>

	<p>the machine learning approach to recognize UAV through its acoustic emission using representative algorithms of Mel frequency cepstral coefficients (MFCCs) for feature extraction and random forest (RNF) classifier for classification. However, temporal and spectral features are devised to demonstrate performances of beam-formed signals (enhanced emitter at desired direction) and raw signal (captured in flying test). Results of extracted features from a beam-formed signal, demonstrate the effectiveness of MFCC performance regardless of a noisy environment with a high accuracy rate as compared to raw signal. RNF classifier was trained to classify feature vector, which is obtained from the feature extraction stage. However, the classifier helped to classify samples from a small data set with good accuracy. It can appropriately classify with a likelihood of around 75% under various training data sets.</p>
<p>PF1041 14:35-14:50</p>	<p>PRI Sinusoidal Modulation Feature Extraction and Pulse Sorting Based on EMD <b>Beihai Wei, Chundong Qi and Wenhua Wang</b> Beijing Institute of Technology, China</p> <p>Abstract—Radar signal sorting is the key technology of electronic warfare, and pulse repetition interval (PRI) is an important parameter of signal sorting. In this paper, a PRI sinusoidal extraction method of modulation feature based on Empirical mode decomposition (EMD) decomposition is proposed. By defining the S function and performing EMD decomposition on it, the Intrinsic Mode Function (IMF) group obtained. Selecting the appropriate IMF component to extract the sinusoidal modulation period. Combined with the S function, the pulse sequence initially screened, and the modulation characteristics are determined according to the screening results. A pulse sorting algorithm is implemented according to the modulation characteristics. The simulation results show that the proposed method can effectively extract the modulation information from multiple radar pulses with different modulation periods, such as the modulation period of the PRI modulated signal, and complete the sorting of the radar pulse.</p>
<p>PF1012 14:50-15:05</p>	<p>A Rotor Feature Extraction Method with Clutter Suppression and High Precision <b>Jiao Bixuan, Rui Yibin, Gao Meng, Fei Haifeng and Yu Qing</b> Nanjing University of Science and Technology, China</p> <p>Abstract—In the process of extracting rotor features using time-frequency analysis, clutter suppression and improving time-frequency resolution have always been problems that need to be solved and improved. The paper proposes a rotor feature extraction method with high time-frequency resolution that can suppress clutter. Firstly, the separation of the micro-motion target and the clutter is realized by the complex empirical mode decomposition (CEMD). The high-resolution time-frequency diagram of the rotor is obtained by the synchrosqueezing improved S transform (SIST) proposed in the paper. The features extracted from the diagram are of high accuracy. The simulation</p>



	results show that this method (CEMD-SIST) has better clutter suppression performance and higher time-frequency resolution than other rotor feature extraction methods.
PF1022 15:05-15:20	<p>Self-Similarity Analysis of Sea Clutter under the Existence of Different Moving Target  <b>Ningbo Liu, Hao Ding, Yonghua Xue, Yonghua Tian and Jian Guan</b>  Naval Aviation University, China</p> <p>Abstract—In frequency domain, moving targets with different velocities will affect the different frequency components of sea clutter spectrum. In order to analyze the nonlinear influence, the piecewise fractional Brownian motion is introduced, which builds the relation between different spectrum parts and the fine/coarse scales, i.e. the target echoes at different velocities can affect the self-similarities of sea clutter at different scales in time domain. Based on the real X-band and S-band sea clutter data, this influence mechanism is studied and verified. The results show that the slow-moving target mainly affects the self - similarity of the sea clutter sequence at the coarse time scales, and the fast-moving target mainly affects the self - similarity of the sea clutter sequence at the fine time scales. This conclusion lays the foundation for introducing the fractal theory into the sea clutter spectrum analysis and target detection in frequency domain.</p>
PF1028 15:20-15:35	<p>Multiple Target DOA Estimation with Single Snapshot in Sonar Array  <b>Jiani Wu and Changchun Bao</b>  National University of Defense Technology, China</p> <p>Abstract—In the field of sonar detection, the most commonly used method for direction of arrival (DOA) estimation of underwater targets is the beamforming algorithm. However, due to the Rayleigh limit of resolution, this method cannot effectively resolve multiple targets within one beam. In this paper we propose a DOA estimation method using a single snapshot to resolve two targets in a single beam. We first establish an echo model of two unresolved targets with sonar array. Then we derive an improved monopulse method to estimate the DOA of the targets according to the maximum likelihood estimation principle. Finally, the performance of this method is evaluated by comparison experiments in the cases of varying SNR, inter-target angle separation and inter-target amplitude differences. The simulation results indicate that, method performs very well in many aspects, including smaller estimation error and enhanced adaptation to inter-target amplitude difference.</p>
PF1033 15:35-15:50	<p>Frame-level Speech Enhancement Based on Wasserstein GAN  <b>Chuan Peng, Tian Lan, Meng Li, Sen Li and Qiao Liu</b>  University of Electronic Science and Technology of China, China</p> <p>Abstract—Speech enhancement is a challenging and critical task in the speech processing research area. In this paper, we propose a novel speech enhancement model based on Wasserstein generative adversarial networks, called WSEM. The</p>

	<p>proposed model operates on frame-level speech segments by using an adjacent frames extension mechanism, to enforce the mapping from noisy speech to the clean target, which makes it distinctly different from other related GAN-based models. We compare the performance of WSEM with related works on benchmark datasets under different signal-to-noise (SNR) conditions, experimental results show that WSEM performs comparable to the state-of-the-art approaches in all the tests, and it performs especially well in low SNR environments.</p>
<p>PF1039 15:50-16:05</p>	<p>Multi-target Multi-Bernoulli Filtering Based on Propagator Method for DOA Tracking  <b>Jun Zhao, Sunyong Wu, Xudong Dong, Qiutiao Xue and Ruhua Cai</b>  Guilin University of Electronic Technology, China</p> <p>Abstract—Aiming at the problem of Direction of Arrival (DOA) tracking for multiple target, this paper proposes a DOA tracking algorithm based on Propagator Method (PM) under Multi-Bernoulli filtering framework. The proposed algorithm uses particle filter to approximate the posterior distribution of target, where the calculation of likelihood function is the key of the update step. The eigendecomposition of the covariance matrix is needed when the likelihood function is replaced by MUSIC spatial spectrum function. In order to reduce the computational complexity of the matrix eigendecomposition, we use the spatial spectral function of PM to replace the pseudo-likelihood function of particle filter, and further exponential weighting is used to enhance the weight of particles at high likelihood area and make resampling more efficient. The simulation results show that the proposed algorithm can effectively track the DOA and estimate the number of multiple maneuvering target.</p>
<p>PF1044 16:05-16:20</p>	<p>Lifting Wavelet Denoising Based on Pulsar Wavelet Basis  <b>You Sihai, Wang Hongli, FengLei, He Yiyang, Xu Qiang, Xiao Yongqiang</b>  Rocket Force University of Engineering, China</p> <p>Abstract—In the X-ray pulsar navigation process, since the pulsar signal obtained by the epoch folding contains a large amount of noise, the signal must be denoised in order to obtain higher positioning accuracy. In order to further optimize the denoising effect and improve the algorithm in real time, this paper proposes a pulsar wavelet base and implements its lifting scheme. In this paper, wavelet multi-level decomposition is performed on the pulsar outline, then a wavelet base based on the pulsar's own signal is constructed according to the low-frequency coefficients, and its lifting method is realized. Matlab simulation shows that compared with db4 and db5 methods, the proposed method performs better in terms of signal-to-noise ratio, mean square error, peak relative error, peak position error and real-time performance. Although the peak error of the db1 wavelet is relatively small, its signal-to-noise ratio is too large, and the overall performance is obviously not as good as the proposed method. The proposed signal-to-noise ratio is up to 4.2dB higher than the db4 and db5 methods, and the</p>

mean square error is only 24.3% of the db4 and db5 methods. The peak position error is only 50% of the db4 and db5 methods.
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**Coffee Break <16:20---16:35>**

<p>PF1049 16:35-16:50</p>	<p>Acoustic Spectrum and Signature Analysis on Underwater Radiated Noise of a Passenger Ship Target based on the Measured Data  <b><i>Liu Yan-sen, Wang Yang and Yang Xue-meng</i></b>  Science and Technology on Underwater Test and Control Laboratory,  China</p> <p>Abstract—The merchant ships including passenger ship target are one of important source of sea environment noise, and is also the primary background jam of underwater passive detection and target recognition, especially areas in shore. Consequently, this paper mainly focuses on measuring and analyzing acoustic spectrum and signature of underwater radiated noise originated from a passenger ship with more than ten thousands of tonnages, especially focusing on the distribution of power and frequency, the amount of stable line-spectrum, structure of envelope modulation spectrum and its stability of amplitude. And the analysis results can be further applied in the studies on underwater passive detection, target recognition and ship acoustic design, especially for passenger ships.</p>
<p>PF1007 16:50-17:05</p>	<p>Adaptive Time-varying Clutter Suppression Algorithm Basedon TAVFF Using IR-UWB Radar  <b><i>Haifan Liu, Zhaocheng Yang, Runhan Bao and Mengxia Chen</i></b>  Shenzhen University, China</p> <p>Abstract—Clutter suppression, especially in time-varying environments is a hindrance that must be solved for radar systems applied to unmanned vehicles. However, exponential moving average (EMA) method, a common background subtraction technique, does not handle such a situation very well because the fixed parameter constrains the updation of the estimated clutter. In this paper, we propose a novel adaptive clutter suppression algorithm to adjust the parameter of EMA method under the background of time-varying clutter. The main idea is to adopt a low-complexity time-averaged variable forgetting factor (TAVFF) mechanism. The proposed algorithm is assessed with data recording measured background clutter and a simulated moving target. The simulation results demonstrate our proposed algorithm has achieved both fast convergence and good steady-state performance.</p>
	<p>Main Lobe Jamming Suppression Algorithm Based on Blocking Matrix Pre-processing and Covariance Matrix Reconstruction</p>

<p>PF1016 17:05-17:20</p>	<p><b><i>Zhang Meng, Song Rui, Zhang Xinyu, Zhang Zijing and Song Wanjie</i></b> Xidian University, China</p> <p>Abstract—Regarding the main-lobe jamming suppression algorithm of phased array radar, the paper analyzes various anti-jamming algorithms based on blocking matrix pre-processing (BMP) according to the study of current anti-main lobe jamming technique in the space-time domain, including the weighting coefficient compensation, whitening, diagonal loading and linear constraint combined with diagonal loading beam retention algorithms. Inspired by the covariance matrix reconstruction (CMR) algorithm of eigen-projection matrix preprocessing, the paper combines modified CMR and BMP algorithm to suppress main lobe jamming. The modified CMR can not only be used when the dimension is lost caused by BMP, but also solve the distortion problems such as the main lobe peak offset in the adaptive beam forming synthesis. The biggest advantage of BMP combined with modified CMR algorithm is that its anti-jamming performance is excellent and stable when the sampling snapshot contains the target signal. Meanwhile, the algorithm complexity and the snapshot sensitivity are both in a low level. In the end, the verification results of the measured data also show the superiority of the proposed algorithm when the sampling snapshot contains the target signal.</p>
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**Closing Ceremony & Best Presenter Awarding | Sichuan Meeting Room <18:40-19:00>**



**Dinner@Restaurant | Sichuan Meeting Room | First Floor <19:00-20:30>**

### **Session II: Electronics and Communication Engineering**

< November 16, 2019, Saturday > Afternoon

Time: 13:50-16:20

Venue: Guizhou Meeting room (贵州厅)

***Chair: Prof. Robert Minasian***

***The University of Sydney, Australia***

10 Presentations: PF1010, PF1045, PF1015, PF1023, PF1024, PF1046, PF1029,  
PF4004, PF1003, PF1025

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<p>PF1010 13:50-14:05</p>	<p>Polynomial Rotation-Polynomial Fourier Transform of Ultrafast Maneuvering Targets Detection</p> <p><b>Ning Lv, Yibin Rui, Liyan Wang, Huan Wang and Chenguang Bian</b> Nanjing University of Science and Technology, China</p> <p>Abstract—For coherent integration detection of ultrafast maneuvering targets with modern radar, a novel long-time coherent integration algorithm, Polynomial Rotation-Polynomial Fourier Transform (PRPFT), is proposed to compensate across range unit range walk (RW) and Doppler frequency migration (DFM) simultaneously caused by super-high speed and strong maneuvering. First, RW can be corrected by the polynomial rotation transform (PRT) via rotating the coordinate locations of echo data. Then, the polynomial Fourier transform (PFT) can realize the compensation of DFM and coherent integration. To reduce the computational complexity, one decision method is proposed to search the multidimensional parameter space. Finally, numerical experiments are provided to validate the effectiveness of the proposed method.</p>
<p>PF1045 14:05-14:20</p>	<p>NIWPT: NLOS Identification Based on Channel State Information</p> <p><b>Chuanyuan Tian, Jiang Yu, Jun Chang and Yonghong Zhang</b> Yunnan University, China</p> <p>Abstract—With the development of wireless technology, Wi-Fi devices are extensively deployed in indoor environments. This fosters the development of Wi-Fi signal-based services and applications, e.g., indoor intrusion detection, human gesture recognition, indoor localization. However, the indoor environments are often complex and variable, Wi-Fi signals from transmitters through multiple paths to reach receivers. There is a large number of Non-Line-Of-Sight (NLOS) paths between the transmitter and the receiver, which causes seriously signal fading, deteriorating the quality of communication links, decreasing the accuracy of recognition application, and increasing the complexity of systems. In this study, an NLOS identification based on the wavelet packet transform (NIWPT) method is proposed. First, NIWPT collects raw channel state information (CSI) signals on the physical layer in current links. Then, NIWPT applies three-layer wavelet packet decomposition on the amplitude of CSI. A set of the wavelet packet coefficient, wavelet packet energy spectrum, information entropy, and logarithmic energy entropy as a feature vector is acquired. After that, the support vector machine is utilized to identify NLOS paths in the current links. Compared with other methods, NIWPT does not need to pre-process the raw CSI signals, it not only maximally reserves influence of the environment on the propagation signal, but also reflects the indoor environment more truly. The experimental results indicate that the recognition accuracy rate of the NIWPT method is 96.23% and 94.75% in the dynamic and static environments, respectively. It proves that the proposed method can effectively identify NLOS paths and has high identification accuracy and universality.</p>

<p>PF1015 14:20-14:35</p>	<p>DRFM Interrupted Sampling Repeater Jamming Suppression Algorithm Based on Clustering <i>Liu Tongan, Dong Mei, Zhang Linrang and Song Wanjie</i> Xidian University, China</p> <p>Abstract—Interrupted sampling repeater jamming (ISRJ), which is generated by digital radio frequency memory (DRFM), has become a hot topic about electronic counter measures (ECM). The paper has proposed an ISRJ suppression algorithm based on numerical statistical characteristic analysis and clustering. First, preprocess the echo data to improve signal-noise ratio according to the numerical statistical characteristic analysis. Next, apply the algorithm of clustering to the echo so as to identify ISRJ and obtain the parameters of ISRJ. Then, reconstruct the jamming based on the ISRJ information from previous step. Finally, use the reconstructed jamming to suppress ISRJ. The simulation result shows that the proposed method can identify ISRJ successfully when SNR of echo is higher than -10dB.</p>
<p>PF1023 14:35-14:50</p>	<p>Model Based Joint Target Tracking and Classification with RCS Measurement <i>Ronghui Zhan and Liping Wang</i> National University of Defense Technology, China</p> <p>Abstract—A model-based joint tracking and classification (JTC) method is proposed for narrowband radar with kinematic and radar cross section (RCS) measurements. The method is derived from the 3D scattering center model (3DSCM), which can construct an explicit relation between the aspect angle and the predicted RCS. To deal with the numerical problem in observation model, a modified likelihood function for RCS measurement is adopted under the assumption of additive Gaussian observation noise. The JTC processing is realized by sequential Monte Carlo (SMC) technique. Specifically, a bank of particle filters are used to obtain type-dependent target state and type estimates. Compared with the traditional JTC methods using low resolution sensor, the proposed method is free from the constraint that target classification has to rely on different maneuvering modes. Simulation results validate the effectiveness of the proposed method with maritime application scenario.</p>
<p>PF1024 14:50-15:05</p>	<p>A Robust Adaptive Amplitude Iteration CFAR Detector in Nonhomogeneous Clutter Environment <i>Renhong Xie, Liyan Wang, Zeyu Sun, Chenguang Bian, Ning Lv, Huan Wang, Peng Li and Yibin Rui</i> Nanjing University of Science and Technology, China</p> <p>Abstract—Constant false alarm rate (CFAR) detectors are widely used in modern radar system to declare the presence of targets. Due to the serious masking effects under the multiple targets situation and the clutter edge, the detection probability of CFAR detectors decrease sharply and the alarm rates increase significantly. To solve these</p>

	<p>problems, a robust adaptive amplitude iteration CFAR (AAI-CFAR) algorithm is proposed in this paper and obtains good performance. By combining the 2nd-order statistic, variability index, and the 4th-order statistic, kurtosis, a variable scaling factor is designed in the amplitude iteration to adapt different environment. Plenty of Monte Carlo simulations are applied to evaluate the performance of the proposed method under different clutter scenarios compared with existing CFAR detectors, which illustrate the superiority and robustness of AAI-CFAR.</p>
<p>PF1046 15:05-15:20</p>	<p>Fall Detection Method Using Wi-Fi Channel State Information  <b><i>Yaxin Ran, Jiang Yu, Jun Chang and zheng Zhang</i></b>  Yunnan University of Information Science and Engineering, China</p> <p>Abstract—Aiming at the problems of high cost and complex deployment of traditional human behavior recognition method system, a method for obtaining channel state information (CSI) for human behavior recognition using commercial Wi-Fi equipment is proposed. Using the amplitude and phase characteristics in the CSI as the base signal, the power spectrum entropy is used as a new feature to build a fingerprint library. The support vector machine (SVM) based on artificial fish swarm algorithm (AFSA) is used to classify and identify the action. The optimization of the classification is achieved by optimizing the parameter penalty factor and kernel function parameters in the SVM. According to the verification of real environmental data, the average recognition rate reached 94.64%.</p>
<p>PF1029 15:20-15:35</p>	<p>Advanced Compressed Sensing Approach to Synthesis of Sparse Antenna Arrays  <b><i>Huan Wang, Yibin Rui, Zeyu Sun, Renhong Xie, Peng Li and Ning Lv</i></b>  Nanjing University of Science and Technology, China</p> <p>Abstract—As an effective method in signal reconstruction model, compressed sensing (CS) has achieved excellent performance in sparse array reconstruction. However, it is necessary to set the penalization factor before iterative calculation, which will increase the difficulty to convergence the result to the global optimal solution. In this paper, we remove the process of choosing penalization factor and reconstruction error by modifying the iterative expression as well as alternating direction method of multipliers (ADMM) algorithm respectively. In addition, the improved model is shown to be convex and thus can be solved using the CVX toolbox. Simulation result shows that the reference pattern could be reconstructed with minimum number of antenna elements by the proposed algorithms. Moreover, the proposed methods have significant performance improvement in main sidelobe level (MSL).</p>
	<p>Indoor Trajectory Tracking Algorithm Based on Kalman filter and Geomagnetic Intensity  <b><i>Yuqi Shi, Wangpeng Gui, Canzhen Peng and Ying Zhu</i></b>  Wuhan University of Science and Technology, China</p>



<p>PF4004 15:35-15:50</p>	<p>Abstract—When wireless sensor network is used for indoor trajectory tracking of mobile nodes, the random noise in the environment will affect the stability and accuracy of localization. In order to solve this problem, this paper proposed an indoor trajectory tracking algorithm based on Kalman filter and geomagnetic intensity. Firstly, RSSI data are measured by the Zigbee nodes of the wireless network and the Kalman filter algorithm is used to track the trajectory. Then the distance measurement algorithm is used to search and match the geomagnetism data to locate the trajectory further. In order to verify the effectiveness of this algorithm, the indoor moving target will be located in real time through the measured data. The experimental results show that the localization has a better accuracy after adding the results of geomagnetic intensity matching.</p>
<p>PF1003 15:50-16:05</p>	<p>Research of Real-time High-precision Positioning Technology for Space-based Internet of Things loads Based on RLS</p> <p><b>Jianyun Chen, SiliLiu and Xuzhe Feng</b> National University of Defense Technology, China</p> <p>Abstract—This paper proposes the use of RLS real-time high-precision positioning algorithm in high-precision real-time positioning of space-based internet of things loads, which overcomes the traditional least-squares high order of inverse matrix, large amount of calculation and easy to appear ill-conditioned matrix that can't seek the inverse, can continuously obtaining estimates in real time, suitable for satellite on-orbit applications. The article analyzes the positioning accuracy grade distribution of RLS real-time high-precision positioning algorithm in detail. The analysis results show that the positioning accuracy is mainly affected by the error of frequency measurement, position error and velocity error, and the error of frequency measurement has a great influence. When the satellite position error is 5m, the velocity error is 0.01m/s, and the Doppler error is 0.1Hz, the probability of positioning error less than 1000m is 95.5%, which satisfies the normal distribution standard deviation <math>2\sigma</math> distribution (95.5%).</p>
<p>PF1025 16:05-16:20</p>	<p>Simulation Research on Classification and Identification of Typical Active Jamming Against LFM Radar</p> <p><b>Gao Meng, Li Hongtao, Jiao Bixuan and Hong Yancheng</b> Nanjing University of Science and Technology, China</p> <p>Abstract—In this paper, models of jamming signals are established based on the mechanism of active jamming signals against LFM radar. Five time-domain characteristics and frequency-domain characteristics of jamming signals are extracted. The decision tree method, BP neural network method and decision tree support vector machine (DTSVM) method are used to establish the classification models, and the</p>

## SESSION II

Chengdu, China | November 15-17, 2019

	simulation is performed for identifying and classifying the jamming signals at different jamming-to-noise ratio (JNR). The result shows that the model based on DTSVM method has better adaptability, smaller calculation and higher recognition success rate at low JNR.
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**Coffee Break <16:20---16:35>**

## Session III: Signal Detection and Processing

< November 16, 2019, Saturday > Afternoon

Time: 16:35-18:35

Venue: Guizhou Meeting room（贵州厅）

***Chair: Assoc. Prof. Ningbo LIU***

***Naval Aviation University, China***

8 Presentations: PF1014, PF2001, PF1053, PF3006, PF1004, PF1026, PF1055, PF3009

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<p>PF1014 16:35-16:50</p>	<p>Note Segmentation Based on Prior Knowledge of Music Score  <b>Yu Qing, Rui Yibin, Fei Haifeng and Jiao Bixuan</b>  Nanjing University of Science and Technology, China</p> <p>Abstract—This paper proposes a note segmentation method combining music score, aiming at the problem that cannot segment multi-tone music with more changes in intensity accurately. By extracting the envelope peak value of music signal and matching it with note values and pitch information of musical score, the segmentation of notes is completed. Simulation results show that the method based on the prior knowledge of value and pitch information of music score can not only realize the segmentation of notes of continuous single tone music, but also be suitable for multi-tone music with strong and weak variations.</p>
<p>PF2001 16:50-17:05</p>	<p>SIRS Prediction Method Based on PPG Signal  <b>Xiaodong Zhang, Xiaojun Xia and Shuai Wang</b>  Shenyang Institute of Computing Technology, Chinese Academy of Science, China</p> <p>Abstract—Photoplethysmographic (PPG) signal is an important body sign data, this paper establishes a physiological model by combining linear dynamics method with important physiological variables (mean arterial pressure and heart rate) extracted from photoplethysmographic (PPG), and verifies the relationship between PPG and SIRS: the reduction in the coupling of mean arterial pressure and heart rate characteristics obtained from PPG signals is significantly associated with systemic inflammatory response syndrome (SIRS) symptoms, which remains conspicuous even though after adjusting clinical intervention. Through PPG signal analysis of 270 adult ICU patients from PhysioNet database, power spectrum and transfer function analysis of the method are carried out, and verifies that the method proposed in this paper can be used to reveal the changes associated with SIRS, which provides a possibility for long-term continuous monitoring or detection of SIRS risk for ICU patients under non-invasive conditions.</p>
<p>PF1053 17:05-17:20</p>	<p>Feature Extraction Methods Based on ECG RR Intervals for Diabetes Detection  <b>Qiuping Li, Xin'an Wang, Tianxia Zhao, Ran Li, He Sun, Changpei Qiu and Xuan Cao</b>  Peking University, China</p> <p>Abstract—In this study, we propose two feature extraction methods based on Electrocardiogram (ECG) RR intervals for diabetes Mellitus (DM) detection, respectively on the time and space dimension. Method I is based on the pRRx sequence to detect diabetes subjects via signal recordings, which yielded the highest prediction precision value of 86%. Method II is a new method of meshing Poincaré plot to extract the whole information entropy <math>H(X)</math> and region information entropy <math>H(X)'</math> on the space dimension as features. When the grid gap of the meshing Poincaré plot is set as 50 and 400, we got the highest prediction precision value of 96%, which have</p>

	<p>better effect on the perspective of prediction accuracy comparing with method I . In the future, we will collect more data of diabetic patients with our new improved ECG monitor to further optimize and improve the above feature extraction methods.</p>
<p>PF3006 17:20-17:35</p>	<p>Online Recovery of Time-Varying Signals Based on Sparse Bayesian Learning <b>Daoguang Dong, Guosheng Rui, Wenbiao Tian, Ge Liu, Yang Bao and Song Zhang</b> Navy Aviation University, China</p> <p>Abstract—In order to improve the accuracy of on-line dynamic reconstruction of time-varying signals, a dynamic compressed sensing algorithm based on sparse Bayesian learning named Support-DCS is proposed in this paper. Since there is no need to assume any time-varying law of signal and no need to adjust any model parameters artificially, the algorithm has good adaptability. Three time-varying signal types with different correlation levels are set up for experiments. The experimental results showed that, compared with several main existing algorithms, the proposed algorithm always has remarkable advantages in signal-to-error ratio, while the other algorithms can only be effective when the support set changes slowly and the signal amplitude correlation is strong.</p>
<p>PF1004 17:35-17:50</p>	<p>High-precision coherent compensation of multi-radar signals based on GTD model <b>Li Tao and Dong Mei</b> Xidian University, China</p> <p>Abstract—The purpose of multi-radar echo band fusion is to expand the signal bandwidth and improve the range resolution. Due to the difference of multi-radar space positions and the initial phase of echo, the phase Angle difference is linear phase and fixed phase. Therefore, solving the phase mismatch is the premise and focus of bandwidth fusion. The disadvantage of the existing phase-coherent registration method is that the phase-coherent registration accuracy is low at high noise level. Based on the geometrical diffraction theory (GTD) model, the algorithm analyzes the influence of non-coherent factors on the target echo, and uses the global minimum entropy criterion as the cost function to estimate the linear phase. According to the influence of fixed phase on the target scattering center parameters, a linear least squares method for correcting the pole subspace is proposed to estimate the fixed phase. The simulation results show the advantages and feasibility of the proposed algorithm.</p>
<p>PF1026 17:50-18:05</p>	<p>Low-Resolution Ground Surveillance Radar Target Classification Based on 1D-CNN <b>Renhong Xie, Zeyu Sun, Huan Wang, Peng Li, Yibin Rui, Liyan Wang and ChenGuang Bian</b> Nanjing University of Science and Technology, China</p> <p>Abstract—The performance of radar automatic target recognition (ATR) highly depends on the quality of training database, the extracted features and classification algorithm. Radar target is detected by the Doppler effect in radar echo signal. Through processing the echo signals in different domains, the distinctive characteristic can be obtained intuitively. Furthermore, we can utilize the extracted features to complete radar target</p>

	<p>classification. This paper proposes a novel target recognition method based on 1D-convolution neural network (CNN) aiming at the ATR of low-resolution ground surveillance radar. The proposed approach uses 1D-CNN as feature extractor and softmax layer as classifier. We tested our method on actual collected database to classify human and car, which reached an accuracy of 98%. Compared with conventional artificial feature extraction approaches, our model shows better performance and adaptability.</p>
<p>PF1055 18:05-18:20</p>	<p>Using Machine Learning Techniques to Classify Cricket Sound <i>Jie Xie and Susan M. Bertran</i> Jiangnan University, China</p> <p>Abstract—This study proposes to classify cricket calls using feature selection and ensemble learning in noisy environments. After collecting cricket calls, we first extract both temporal and frequency features from each frame. Then, statistical features over all frames are calculated including mean, variance, skewness, and kurtosis. For temporal feature, we use zero-crossing rate, short-time energy and Shannon entropy. Frequency features include Mel-frequency Cepstral coefficients, spectral centroid, spectral entropy, spectral flux, and spectral roll-off. Next, minimum redundancy maximum relevance is used to select important features and remove redundant information. Finally, ensemble learning of four standard classifiers is used to classify cricket call species and types in noisy environments: k-nearest neighbor, logistic regression, Gaussian naïve Bayes, and random forest. Experimental result shows that the best classification F1-score is 89.5% for classifying five cricket species and two cricket types.</p>
<p>PF3009 18:20-18:35</p>	<p>Noise Analysis of MEMS Gyroscope under Force Rebalance Closed Loop Detection <i>Feng Bu, Bo Fan, Shuwen Guo, Dacheng Xu, Heming Zhao</i> Soochow University, China</p> <p>Abstract—Angle Random Walk (ARW) is an important performance index of the MEMS gyroscope, which is determined by the noise in the control system. In this paper, the thermal noise of gyroscope, the noise of detection circuit and feedback circuit are considered, and the noise model of control system is constructed under force-to-rebalance (FTR) closed-loop detection. The influence of system parameters on the power spectral density (PSD) of noise equivalent rate (NER) is analyzed, and the noise is reduced by adjusting system parameters reasonably. Simulink numerical simulation proves the correctness of the noise model.</p>



**Closing Ceremony & Best Presenter Awarding | Sichuan Meeting Room <18:40-19:00>**



**Dinner@Restaurant | Sichuan Meeting Room | First Floor <19:00-20:30>**

# **Session IV: Advanced Electronic Technology and Sensor Applications**

< November 16, 2019, Saturday > Afternoon

Time: 13:50-16:20

Venue: Yunnan Meeting room (云南厅)

***Chair: Prof. Ho Pui, Aaron HO***

***The Chinese University of Hong Kong, Hongkong***

10 Presentations: PF3005, PF3007, PF3008, PF3011, PF3015, PF4001-A, PF4003-A,  
PF3012, PF3014, PF1054

### **Note:**

- ✧ Please copy your PPT to the computer on November 15 or in the morning of November 16 at the registration table. The size of PPT is 16:9.
- ✧ Please arrive at meeting room 15 minutes prior to the sessions to prepare and test your PowerPoint.
- ✧ Certificate of Presentations will be awarded to each presenter by the session chair when the session is over.
- ✧ One Best Presentation will be selected from each parallel session and the author of Best Presentation will be announced and awarded at the closing ceremony.

<p>PF3005 13:50-14:05</p>	<p>Research on Accuracy Improvement of Non-dispersive Infrared Detection System Based on EMD Noise Reduction Algorithms</p> <p><b>Libin Ch'ien, Yongjie Wang, Ancun Shi and Fang Li</b></p> <p>Institute of Semiconductors, Chinese Academy of Sciences, China</p> <p>Abstract—Gas sensors based on non-dispersive infrared technology have been extensively studied, and dual-channel measurement schemes have been widely adopted due to their unique advantages. However, method to maximize sensor performance with reference signals in dual-channel measurement schemes still requires in-depth exploration. In this study, a methane gas detection system based on mid-infrared LED is designed, applying the empirical modal decomposition algorithm to the signal processing of the sensor. The empirical mode decomposition is employed as the basis to process the measurement and reference signals for an improvement on the system signal-to-noise ratio of 30dB using the traditional white noise suppression method. Further, the interference signal is identified through joint analysis on the intrinsic mode function of the two-path signals, so as to improve the signal-to-noise ratio of 2db by suppressing the interference signal. The empirical mode decomposition algorithm, as an adaptive method for processing non-stationary signals, will play an important role in the field of sensors.</p>
<p>PF3007 14:05-14:20</p>	<p>Fault Detection and Diagnosis of Relative Position Detection Sensor for High Speed Maglev Train Based on Kernel Principal Component Analysis</p> <p><b>Dai Chunhui, Deng Peng and Long Zhiqiang</b></p> <p>National University of Defense Technology, China</p> <p>Abstract—Relative position detection sensor of high speed maglev train is one of the most important sensors in train positioning and speed measurement system. There is a complex circuit structure inside the sensor. How to ensure the reliability of sensors is the key problem to ensure the safe operation of maglev train, it is necessary to detect and diagnose the faults of the sensor which has been replaced or just left the factory. Kernel principal component analysis (KPCA) is used to diagnose sensor faults in this paper. This method is based on sensor data. It has the advantages of simplicity, convenience and high accuracy. The simulation and experimental results show that this method has a good effect on sensor detection and diagnosis.</p>
<p>PF3008 14:20-14:35</p>	<p>Non-Dispersive Infrared Methane Sensor with Semi-elliptical Gas Cell</p> <p><b>Yuehan Li, Shengbo Qi and Zengliang Bi</b></p> <p>Ocean University of China, China</p> <p>Abstract—Here we present a non-dispersive infrared (NDIR) methane sensor with semi-elliptical gas cell for monitoring the lower explosion limit (LEL) of methane (5%VOL in China). The special design of gas cell is used to reduce optical loss. And the novel NDIR scheme with narrowband mid-infrared light emitting diode (mid-IR LED)</p>



	<p>efficiently can solve the problem of humidity and background gas interference in theory and practice. This can be attributed to that the combination of narrowband LED and broadband photodiode (PD) was chosen. And insensitivity to humidity has been validated by experiments. Temperature dependency has been improved by temperature compensation. This scheme is not only used to detect the methane concentration, but also to detect other gas such as carbon dioxide contents in the air if the LED is changed.</p>
<p>PF3011 14:35-14:50</p>	<p>Influence of the Ratio of Gate Length to Source-drain Distance on the Sensitivity of the AlGaIn/GaN HEMT Based Chemical Sensors and Biosensors  <b>Dongyang Xue, Heqiu Zhang, Hongwei Liang, Jun Liu and Xiaochuan Xia</b>  Dalian University of Technology, China</p> <p>Abstract—In this paper, the mechanism of the open-gate AlGaIn/GaN HEMT based sensors were discussed and the effect of the ratio of gate length (<math>L_G</math>) to source-drain distance (<math>L_{SD}</math>) on the transconductance (<math>g_m</math>) of the sensors was investigated. It was shown that the smaller <math>L_G/L_{SD}</math> of the devices would get a higher maximum <math>g_m</math> (<math>g_{m-max}</math>). However, when the gate voltage (<math>V_G</math>) increased to a certain extent, the <math>g_m</math> of the larger <math>L_G/L_{SD}</math> devices would be higher. The experimental results were demonstrated by further theoretical calculation and analysis which is beneficial to enhance the sensitivity of the AlGaIn/GaN HEMT based chemical sensors and biosensors by improving the <math>g_m</math> of them.</p>
<p>PF3015 14:50-15:05</p>	<p>Tunnel Magnetoresistive Sensor Design and Applications for Current Measurement  <i>Li Qiuyang, <b>Chen Siyu</b>, Xiong Suqin and Zhang Penghe</i>  China Electric Power Research Institute, China</p> <p>Abstract—Current sensing plays an important role in electric energy measurement, relay protection, intelligent equipment control and other fields in smart grid. Compared with traditional current transformers, for example, Rogowski coils and Hall current sensors, Tunnel magnetoresistance (TMR) sensor has the advantages of input/output magnetic isolation, AC and DC current measurement ability, wide bandwidth, small size, et al. Accordingly, TMR sensors are applicable for various scenarios and meet multiple current measurement needs. Based on the analysis of the principle of TMR sensor, the structure of current sensor system based on tunnelling magnetoresistance is introduced. Then, the designs of filter circuit and temperature compensation circuit are given. Finally, the experimental results show that TMR current sensor has good performance for current measurement, indicating widely applications in the field of current measurement in the future.</p>
	<p>Electrodeposition of ZnO with Different Morphologies onto GaN to Form Heterojunction towards Enhanced Gas Sensing  <b>Chao Wang and Ge-Bo Pan</b>  Suzhou Institute of Nano-Tech and Nano-Bionics, Chinese Academy of Sciences, China</p>

<p>PF4001-A 15:05-15:20</p>	<p>Abstract—Nowadays, environmental protection has been extensively investigated for sustainable social development. Among gas detecting devices, gas sensor has a significant effect on many aspects in our society owing to its small size, cheap price and capable of real-time monitoring, which has also obtained much progress and propelled by the development of nanotechnology. Current research efforts are directed toward developing high-performance gas sensors with different morphologies. Zinc oxide (ZnO) has the advantages of abundant surface morphologies, good chemical and thermal stability and superior electrical properties.<sup>1</sup> ZnO nanorods and nanoflowers were prepared on gallium nitride (GaN) substrates by electrodeposition.<sup>2</sup> Due to ZnO forming porous network channels for gas diffusion in and out, the gas sensing performance of ZnO/GaN heterojunctions could be attributed to the enhanced electron transport and the favorable charge transfer resulting from the excellent transport capability of GaN. Compared to pure sensing materials based gas sensor, the ZnO/GaN based gas sensor improves overall performance involving all parameters. The in-situ fabrication of sensing material makes our sensors extremely attractive in the field of gas detection.</p>
<p>PF4003-A 15:20-15:35</p>	<p>Construction of Hierarchical SnS<sub>2</sub> Based Heterostructures and Their Application in Gas Sensing</p> <p><b>Juanyuan Hao, Quan Sun and You Wang</b> Harbin Institute of Technology, China</p> <p>Abstract—Unique features of SnS<sub>2</sub> make them a sensitive material ideal for preparing high-performance nitrogen dioxide (NO<sub>2</sub>) gas sensors. However, sensors based on pristine tin disulfide (SnS<sub>2</sub>) fail to work at room temperature due to their poor intrinsic conductivity and weak adsorptivity toward target gas, thereby impeding their wide application. The introduction of hierarchical heterostructures offers significant potential to enhance the conductivity, increase the adsorptivity, and boost charge transfer during sensing process. This paper will cover p-n and n-n type of heterostructures based on SnS<sub>2</sub>. The effect of difference of Fermi energy level between the two components in the heterostructures on the sensing performance has been discussed in detail. The sensing mechanism is also investigated in the different type of heterostructures. The design of proper heterojunctions may inspire the future development of other sensitive materials based on hybrid 2D materials for low-power gas sensors.</p>
<p>PF3012 15:35-15:50</p>	<p>AlGaIn/GaN Open-gate High Electron Mobility Transistors for Glucose Detection</p> <p><b>Jun Liu, Hongwei Liang, Dongyang Xue, Heqiu zhang, Huishi Huang and Wenping Guo</b> Dalian University of Technology, China</p> <p>Abstract—AlGaIn/GaN high electron mobility transistor (HEMT) has more remarkable properties for the optoelectronics and high voltage, high power at microwave</p>

	<p>frequencies. A less widely studied application is high sensitivity to detect a wide range concentration of glucose. In this work, a photo-electrochemically treated open-gate AlGaIn/GaN HEMT sensor for glucose detection was developed. Through photo-electrochemical treatment, the threshold voltage of sensor can be adjusted from -3.3 V to -1.3 V at a swept gate voltage, which can allow the sensor to operate at a zero gate voltage. Operation at a lower gate voltage is conducive to the stability of sensor. The fabricated biosensor exhibited good current response to glucose concentration over a wide linear range with high sensitivity above <math>8.61 \times 10^5 \mu\text{A mM}^{-1} \text{cm}^{-2}</math>. The performance of sensor demonstrates the possibility of using AlGaIn/GaN HEMTs for glucose detection of biochemical application.</p>
<p>PF3014 15:50-16:05</p>	<p>Detection of Methylated Cytosine on Single Strand DNA Based on Immune-functionalized and Glutaraldehyde Modified Liquid Exfoliated Graphene Field Effect Transistor</p> <p><b>Jizhao Zhang, Shihui Hu, Zhongrong Wang and Yunfang Jia</b> Nankai University, China</p> <p>Abstract—Detection of the 5-methylcytosine (5mC) is one of the requirements of modern epigenetics research. The main challenges in this issue are how to distinguish the 5mC site from the unmethylated ones in the chain of nucleotides, and determine its amount. To streamline the tedious operations in traditional bisulfite conversion (BC) and polymerase chain reaction (PCR) based detection methods, lots of graphene derivatives and electrochemistry (EC) sensors have been exploited. In this work, we would like to propose an electronic method for DNA methylation detection by using five testing single strand DNA (ssDNA) chains as proof-of-concepts, based on the glutaraldehyde modified liquid exfoliated graphene field effect transistor (LEG-FET). First of all, for the sake of identifying the 5mC site, the immunorecognition strategy is utilized and incorporated with LEG-FET working principle. That is, the methylation sites on testing ssDNA chains are first recognized by the fixed 5mC's antibody (5mCab) molecules on the channel of LEG-FET, then they are transduced to the varied current between the electrodes of drain and source (<math>I_{DS}</math>). It is found, the changing ratios of <math>I_{DS}</math> (<math>\Delta I_{DS}/I_{DS0}</math>) are in negative relation with the amount of 5mC sites (<math>N_{mC}</math>) at each of the ssDNA concentrations (<math>C_{ssDNA}</math>). When <math>C_{ssDNA}</math> is varied from 1 to <math>10^6</math> pM, the slopes of the responding curves <math>-\Delta I_{DS}/I_{DS0}</math> vs. <math>N_{mC}</math> are increased from 0.54 to 3.70 %/<math>N_{mC}</math>; meanwhile, at each of constant <math>N_{mC}</math>, the slopes of <math>-\Delta I_{DS}/I_{DS0}</math> vs. <math>C_{ssDNA}</math> are also examined to proof the repeatability in DNA methylation detection.</p>
<p>PF1054 16:05-16:20</p>	<p>Cross Domain Sentiment Classification of Thai Reviews using Co-Train Model</p> <p><b>Warakorn Boonpetch and Orachat Chitsobhuk</b> King Mongkut's Institute of Technology Ladkrabang, Thailand</p> <p>Abstract—Online reviews are significant sources of information, which is useful for</p>

supporting customer and entrepreneur decision in terms of product and service satisfaction analysis. Online reviews containing feedback from various domains makes it difficult to analyze and classify all comments at once. The proposed technique analyses the cross-domain Thai review data using a co-train machine learning model. The co-train model consists of multiple single domain specific models followed by refinement analysis for the final sentiment classification. This allows for full flexibility in training of each individual domain, which can lessen the limitation on training complexity due to simple training on single domain. The experiments have been conducted on Wongnai restaurant domain and IMDB movie domain data. Our co-train model can achieve the highest average accuracy of 86.10 percent for cross-domain sentiment classification with approximately 38 seconds processing time.



**Coffee Break <16:20---16:35>**

## **Session V: Image Processing Technology and Method**

< November 16, 2019, Saturday > Afternoon

Time: 16:35-18:35

Venue: Yunnan Meeting room (云南厅)

***Chair: Prof. Kezhi Mao***

***Nanyang Technological University, Singapore***

8 Presentations: PF1018, PF1019, PF1027, PF1050, PF1051, PF1005, PF1006, PF1009

### **Note:**

- ✧ Please copy your PPT to the computer on November 15 or in the morning of November 16 at the registration table. The size of PPT is 16:9.
- ✧ Please arrive at meeting room 15 minutes prior to the sessions to prepare and test your PowerPoint.
- ✧ Certificates of Presentations will be awarded to each presenter by the session chair when the session is over.
- ✧ One Best Presentation will be selected from each parallel session and the author of Best Presentation will be announced and awarded at the closing ceremony.

<p>PF1018 16:35-16:50</p>	<p>Face Recognition Based on Most Value Averaging LBP And Gray Level Co-occurrence Matrix</p> <p><i>Fu Bo, <b>Xu Chao</b>, Zhao Xilin, Xu Guanghui and Fang Na</i></p> <p>Hubei University of Technology Institute of Electrical and Electronic Engineering, China</p> <p>Abstract—In order to solve the problem that local binary pattern (LBP) is easy to lose some details when extracting facial features and image rotation leads to low recognition rate, a most value averaging LBP combined with gray level co-occurrence matrix feature algorithm is proposed. The method uses the most value averaging LBP algorithm to extract image features and reduces the feature dimension by principal component analysis (PCA); at the same time, considering the gray level co-occurrence matrix feature of the image, the most value averaging LBP feature is combined with the gray level co-occurrence matrix feature, and the k-nearest neighbor method (KNN) is used to classify and identify the face in low-dimensional space. The experimental results show that the proposed method has a good recognition effect.</p>
<p>PF1019 16:50-17:05</p>	<p>Design and Simulation of Terahertz Near Field SAR Real-Time Imaging System</p> <p><i><b>Yuzhao Li</b>, Qingwei Ji, Wenqiang Shi, Jiahui Hong, Simin Cheng and Wei Zhang</i></p> <p>Beijing Institute of Remote Sensing Equipment, China</p> <p>Abstract—Terahertz (THz) technology is increasingly being used in a wide range of applications, and terahertz radar systems have also been developed in radar applications. In this paper, the terahertz radar system is used for 2 dimensional (2D) real-time imaging in near-field scenario within 20m. A real-time imaging system of 170GHz Synthetic Aperture Radar (SAR) is designed, and the system is simulated and verified by Doppler Beam Sharpening (DBS) algorithm. The simulation results show that the system can utilize uniform linear motion to synthesize a short aperture in the near-field range and form 2D image of scattering points in the scene. The imaging effect is good.</p>
<p>PF1027 17:05-17:20</p>	<p>Hand gesture Recognition Based-on Range-Doppler-Angle Trajectory and LSTM network Using an MIMO radar</p> <p><i><b>Xinbo Zheng</b>, Zhaocheng Yang, Kaixuan He and Haifan Liu</i></p> <p>Shenzhen University, China</p> <p>Abstract—Touchless hand gesture recognition is of great importance for human-computer interaction (HCI). In this paper, we present a hand gesture recognition approach based on range-Doppler-angle trajectory and the long short-term memory (LSTM) network with a 77GHz frequency modulated continuous wave (FMCW) multiple-input-multipleoutput (MIMO) radar. Firstly, the hand gesture fast-time-slow-time-antenna 3 dimension (3D) data are collected by the FMCW MIMO radar. Additionally, by performing the discretize Fourier transform (DFT) to the fast-time and slow-time, respectively, we obtain the range-profile and Doppler-profile. Then, by</p>

	<p>using the multiple signal classification (MUSIC) approach, we estimate the angle-profile of the hand gestures. To smooth and eliminate the noise effects, we apply the Kalman filtering to the estimated range-profile, Doppler-profile and angle-profile, respectively, and obtain the range-Doppler-angle trajectory signature. After that, by exploiting the temporal and spatial correlations, we construct a LSTM network for the hand gesture recognition. Experiments with 6 hand gestures are conducted and show that the proposed approach can recognize 6 hand gestures with an average accuracy over 97%.</p>
<p>PF1050 17:20-17:35</p>	<p>Text Matching Based on Reconstructed Color Interaction Image  <b>Haohao Nie, Tanfeng Sun, Xinghao Jiang and Ke Xu</b>          Shanghai Jiao Tong University, China</p> <p>Abstract—Plenty of natural language processing tasks can be modeled as text matching, such as question answering, machine translation and so on. An elementary and efficacious method is to distill matching patterns from words, phrases and sentences to obtain the matching score. In this paper, Reconstructed Color Interaction Image (RCII) is proposed to convert text matching to color image recognition. First, two texts are reconstructed and similarity operations are adopted to generate Color Interaction Image (CII). Then CNN is applied to extract hierarchical and elaborate matching information. Finally, fully connected layers are employed to obtain the matching score. Experiments have proved the effectiveness of our method.</p>
<p>PF1051 17:35-17:50</p>	<p>Design of Wideband Real-Time SAR Imaging System  <b>Shi wenqiang, Ji Qingwei and Bao Xihao</b>          Beijing Institute of Technology, China</p> <p>Abstract—Aiming at the requirement of the range and azimuth resolution of the near range target detection system, this paper completed the design of wideband real-time SAR imaging system. The system adopts “FPGA+RFADC+RFDAC” architecture, it can timely generate LFM(Linear frequency modulation) signal in L/S frequency band , complete the preprocessing of radar echo signals and realize the real-time SAR imaging algorithm, finally upload the imaging results in real time. The effectiveness of each function of the system is verified by simulation and actual measurement.</p>
<p>PF1005 17:50-18:05</p>	<p>Tree-Structured Bayesian Compressive Sensing based Image Watermarking  <b>Xiumei Li, Huang Bai and Junmei Sun</b>          Hangzhou Normal University, China</p> <p>Abstract—Watermarking is of vital importance for copyright protection and content authentication of images. With the development of compressive sensing, it has been successfully applied for watermarking with improved performance. Since an image can exhibit tree structure in wavelet domain, a new watermarking embedding and extraction method is proposed based on tree-structured Bayesian compressive sensing. The Markov Chain Monte Carlo (MCMC) method and the variational Bayesian (VB)</p>

	<p>analysis can be used for inference, respectively. Attacks to the watermarking, such as Gaussian noise, salt and pepper noise, Gaussian filtering, and JPEG compression, are given to evaluate the watermarking robustness with comparison to other reported reconstruction algorithms such as basis pursuit, orthogonal matching pursuit, Bayesian compressive sensing using relevance vector machine (RVM), and Bayesian compressive sensing with VB. Simulation results and comparisons show remarkable advantages of the tree-structured Bayesian compressive sensing for watermarking embedding and extraction.</p>
<p>PF1006 18:05-18:20</p>	<p>Hand Gesture Recognition Based-on Convolutional Neural Network Using a Bistatic Radar System</p> <p><b><i>Kaixuan He, Zhaocheng Yang, Luntao Zhuang and Xinbo Zheng</i></b> Shenzhen University, China</p> <p>Abstract—Recently, hand gesture recognition based-on radar has attracted many researchers in the field of human–computer interfaces. However, the number of kinds of hand gestures and recognition accuracy can be still increased. In this paper, we propose a hand gesture recognition approach based on convolutional neural network (CNN) using a bistatic radar system. Firstly, we build a bistatic radar system which consists of two pulse radars and define an active area of hand gesture called gesture desktop. Then, two time-distance maps are obtained by signal pre-processing, and we build a Bistatic-CNN with two branches of convolutional layers as a classifier to recognize 14 hand gestures. The bistatic radar system can offer us much more information of hand gesture from different perspectives and achieve much higher hand gesture recognition accuracy than single radar. The experimental results based on the measured data show that the proposed approach can recognize 14 hand gestures with average accuracy over 98%.</p>
<p>PF1009 18:20-18:35</p>	<p>Velocity Estimation and Compensation of High-speed Target from Undersampled Data</p> <p><b><i>Shuanghui Zhang, Yongxiang Liu and Xiang Li</i></b> National University of Defense Technology, China</p> <p>Abstract—For the high-speed moving target, its high-resolution range profile (HRRP) obtained by wideband radar is stretched by the high order phase error. To obtain well-focused HRRP, the phase error induced by target velocity should be compensated, utilizing either measured or estimated target velocity. When the radar echo is undersampled, however, the HRRP will suffer from strong side and grid lobes, which deteriorates the performance of velocity estimation. A novel velocity estimation and compensation of high-speed target for undersampled data is proposed. The variational Bayesian inference based on the Laplacian scale mixture (LSM) prior is utilized to reconstruct HRRP with high resolution from the undersampled data. During the reconstruction of HRRP, the minimum entropy-based Newton method is used to</p>



## SESSION V

Chengdu, China | November 15-17, 2019

	estimate the velocity to compensate the high order phase error. Experimental results validate the effectiveness of the proposed velocity estimation and compensation algorithm.
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**Closing Ceremony & Best Presenter Awarding | Sichuan Meeting Room <18:40-19:00>**



**Dinner@Restaurant | Sichuan Meeting Room | First Floor <19:00-20:30>**

## Poster Presentation

< November 16, 2019, Saturday > Morning

Time: 9:45-10:10

Venue: Tianfu Meeting room (天府厅)

### Note:

- ✧ Suggested Poster with size of A1 (594mmx840mm width\*height), with conference short name and paper ID on right up corner.
- ✧ Posters are required to be condensed and attractive. The characters should be large enough so that they are visible from 1 meter apart.
- ✧ One Best Presentation will be selected from poster session and the author of Best Presentation will be announced and awarded at the closing ceremony.

PF1011	<p style="text-align: center;">A Novel Method of Suppressing Multipath Interference Based on Brewster Effect  <i>Wang Yijin and Tong Chuangming</i>  Air Force Engineering University, China</p> <p>Abstract—Multipath interference is the main threat to the ultra-low targets detection. A novel method of suppressing multipath interference based on Brewster Effect is proposed. The traditional Four-Path Model is modified by complex reflection coefficient and antenna pattern. The numerical hybrid method PO+MEC is used to calculate the scattering fields of targets. The method based on scattering center model is introduced to generate the echo signal. The effect of the method proposed in this paper is analyzed and proved in two aspects, scattering field and echo signal. The conclusion is that, if the active seeker detect the ultra-low target using the Brewster angle as the grazing angle in VV-polarization, the multipath interference is well suppressed. Under maritime environment, the Brewster angle is approximate <math>7^\circ</math>. The work in this paper is of great significance in military field.</p>
PF1021	<p style="text-align: center;">Zero-attracting Affine Projection M-estimate Algorithm for Sparse System Identification in Impulsive Interference  <i>Yi Chen and Jinfeng Xie</i>  Chongqing Academy of Information and Communications Technology, China</p> <p>Abstract—Proposed is a novel affine projection algorithm (APA) based on the M-estimate objective function with <math>L_0</math> norm constraint. APA degenerates severely in impulsive interference and has no advantage for sparse system identification. In this letter, we use an M-estimate objective function to improve the robustness of the APA against impulsive interference, and a <math>L_0</math> norm cost to improve the convergence rate for a sparse system. Simulation results show that the proposed algorithm outperform traditional algorithms in sparse system identification experiments that include correlated input and impulsive interference.</p>
PF1031	<p style="text-align: center;">Optimization of the OSVOS Model  <i>Shizhan Hong, Tieyong Cao, Shengkai Xiang, Zheng Fang, Xiaotong Deng, Yifeng Peng and Lei Xiang</i>  PLA Army Engineering University, China</p> <p>Abstract—We solve the problem of video object segmentation by investigating how to expand the role of convolution in convolutional neural networks. Based on the One-Shot Video Object Segmentation (OSVOS) which can successfully tackle the task of semi-supervised video object segmentation, we introduce U-shape architecture. We first build a Global Guidance Module (GGM) on the bottom-up path to provide location information of potentially significant objects for layers of different feature levels. Then we design a Multi-scale Convolution Module (MCM) to fully get feature information and a Feature Fusion Module (FFM) to make the coarse-level semantic information well fused with the fine-level features from the top-down pathway. GGM and FFM allow the</p>

	<p>high-level semantic features to be progressively refined, yielding detail enriched segmentation maps. The experimental results on DAVIS 2016 data set shows that our proposed approach can more accurately locate the segmentation objects with sharpened details and our model has improved on all indicators than OSVOS.</p>
PF1034	<p>Implementation of Channel Simulation and GMSK Modulation Signal Transmission System Based on GNU RADIO</p> <p><b>Tan Jiyuan, Zhong Zhaogen and Liu Renxin</b></p> <p>Naval Aviation University, China</p> <p>Abstract—Aiming at the multi-standard and multi-system requirements of modern wireless communication systems, it is more and more important to process a large number of signals and data efficiently, quickly and relatively low-cost. The software radio technology has wireless communication by its easy modification and low cost. Technology has been upgraded to a new level of software and ease of expansion. Firstly, the GNU Radio platform, software architecture and hardware platform are described. Then, using the general software radio platform, the simulation and implementation of communication channels such as fading and drift are completed in the GNU Radio programming environment. Based on this, GNU Radio+ USRP is further designed. Transmission and reception of modulated signals of GMSK. Thereby wireless communication based on software radio platform is realized. From the experimental results, the system can transmit and receive GMSK modulated signals better.</p>
PF1042	<p>An Opinion-unaware Blind Quality Assessment Algorithm for Multiply Distorted Images</p> <p><b>Tongle Wang and Junchen Deng</b></p> <p>East China Normal University, China</p> <p>Abstract—The blind image quality assessment algorithms produced every year are mostly “opinion-aware” (OA). It means that they require large numbers of subjective quality scores for regression model training. Subjective quality scores are not easily available, so people are eager to design an opinion-unaware (OU) algorithm which has free subjective quality scores. Besides, the OU algorithm has greater generalization capability than the OA algorithm. Therefore, we propose an OU algorithm based on a visual codebook for multiply distorted image quality assessment. Extensive experiments conducted on the three databases demonstrate that the proposed method is superior to the existing five OU methods in terms of the coherence with the human subjective rating. The MATLAB code is available at <a href="https://tonglewang.github.io">https://tonglewang.github.io</a>.</p>

## NOTE

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