

# IEEE ICMA 2019 Conference Workshop

## World Premium Workshops on Robotics

Sunday, August 4, 2019

14:00 - 15:40

Conference Room 1, 1F

Tianjin Shangri-La Hotel, Tianjin, China

### Regional Analysis of Distributed Parameter Systems and Their Applications for the Control of Cyber–Physical Systems

**Venue:** Conference Room 1, 1F

Tianjin Shangri-La Hotel, Tianjin

**Date and Time:** 14:00 - 15:40, August 4, 2019

#### **Organizers:**

Dr. YangQuan Chen, University of California, Merced, USA

Dr. Fudong Ge, China University of Geosciences, Wuhan, PR China

#### **About the workshop:**

It is well known that Cyber-physical systems (CPSs) with integrated computational and physical processes can be regarded as a new generation of control systems and can interact with humans through many new modalities. The objective of CPS is to develop new science and engineering methods in which sensor and actuator configurations, and physical designs are compatible, synergistic, and integrated at all scales. Many CPSs are characterized by parameters and variables that depend both on time and location so that distributed parameter systems (DPSs) governed by partial differential equations (PDEs) can be used to adequately represent the cyber-physical process dynamics. Moreover, due to the strong interactions between components in these DPS dynamics, there are cases when the system is not controllable or observable in the whole domain of interest but can be controllable and observable in a subdomain. Thus, regional analysis makes more practical sense. Regional

sensing and actuation is getting more and more important in this CPS age with cloud computing and big data movements.

This workshop will prepare the IEEE ICMA 2019 audience with 1) compelling reasons why this research theme is important, 2) what are basic concepts and existing results, and 3) what are rich future research opportunities.

### **List of Speakers and Schedule**

<b>Time</b>	<b>Topics</b>	<b>Speaker List</b>
13:55-14:00	Welcome speech	
14:00-14:30	Regional analysis of DPSs and Their Applications for the control of CPSs – 25 years in review	Dr. YangQuan Chen, University of California, Merced, USA
14:30-15:00	Why we should use regional analysis: From MAS-net project to CPS to CHS	Dr. YangQuan Chen, University of California, Merced, USA
15:00-15:30	Regional analysis of fractional order DPSs and Their Applications for the control of CPSs –(Ge)	Dr. Fudong Ge, China University of Geosciences, Wuhan, PR China
15:30-15:40	Panel Discussion	Moderators: All speakers

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Regional Analysis of Distributed Parameter Systems and Their  
Applications for the Control of Cyber–Physical Systems

## The Workshop speakers

**Dr. YangQuan Chen, Professor**

Mechatronics, Embedded Systems and Automation (MESA) LAB,

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<https://scholar.google.com/citations?user=RDEIRbcAAAAJ&hl=en>

**YangQuan Chen** joined University of California, Merced in summer 2012 with a vision to promote the wide-spread use of low cost scientific data-drones in precision agriculture and environmental monitoring. His unmanned aerial systems (UAS) team at UC Merced has been pursuing research excellence in innovative use of data-drones for crop, water, soil, dust, air, and fire etc. Dr. Chen received Ph.D. from Nanyang Technological University Singapore in 1998. His current areas of research interest include: applied fractional calculus in controls, signal processing and energy informatics; distributed measurement and distributed control of distributed parameter systems using mobile actuator and sensor networks; mechatronics; multi-UAV based cooperative multi-spectral “personal remote sensing” for precision agriculture and environmental monitoring. He is an Associate Editor for IFAC journals of Mechatronics and Control Engineering Practice, Fractional Calculus and Applied Analysis, IET Control Theory and Applications, IEEE Transactions of Control Systems Technology, ISA Transactions and Cogent Engineering (Systems and Control).

He also serves as the Topic-Editor-in-Chief in “Field Robotics” for International Journal of Advanced Robotic Systems (IJARS), a Senior Editor for International Journal of Intelligent and Robotic Systems, and an associate editor for Journal of Intelligent Service Robotics. He was an associate editor for ASME Journal of Dynamical Systems, Measurement and Control (2009-2015) and a Founding Associate Editor for Unmanned Systems (2013-2015). Dr. Chen is a member of ASPRS, AUVSI, AMA, IEEE, ASME, AIAA, and ASEE. He serves as the co-chair for IEEE RAS TC on Aerial Robotics and UAV, IEEE-USA CTAP, and Program Co-chair for ICUAS 2016, Washington, DC, and General Co-Chair for ICUAS 2017, Miami, FL. He can be reached by email: [yqchen@ieee.org](mailto:yqchen@ieee.org)

**Dr. Fudong Ge, Associate Professor**

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**Fudong Ge** earned his Ph.D. in the College of Information Science and Technology of Donghua University, Shanghai, China in 2016. He joined the MESA Lab of the University of California, Merced in October, 2014 as an Exchange Ph.D. student. He is now an associate professor at the School of Computer Science, China University of Geosciences, Wuhan, Hubei Province, China. His research interests include existence, stability/stabilization of solutions for fractional differential equations; continuous time random walks and anomalous diffusion systems; distributed measurement and distributed optimal control problems in general distributed parameter systems or cyber-physical systems in general form. He can be reached by email: [gefd@cug.edu.cn](mailto:gefd@cug.edu.cn)