2021 4th IEEE International Conference on Industrial Cyber-Physical Systems

Monday, 10 May 2021

07:00-07:20	*Plenary Session Room* **Opening Ceremony**
07:20-08:20	*Plenary Session Room* **Keynotes: Prof. Dr.-Ing. Armando Walter Colombo - Learning, Living and Working with Industrial Systems-of-Cyber-Physical Systems** Abstract: After presenting the scientific and technical background behind Industrial Systems-of-CyberPhysical Systems (ICPS), their relationship to other frameworks like Systems-of-Systems Engineering, Industry 4.0, Industrial Internet-of-Things (IIoT), and associated technology standardization/ normalization initiatives (such as e.g. DIN SPEC 91345 RAMI4.0), this Plenary Talk offers an overview of major requirements to educating, teaching, training people (workers with or without decision-making responsibilities in an Industry 4.0 system, as well as students, technicians and engineers) for learning, living and working with Systems-of-ICPS in a digitalized eco-system. The audience/participants of the Talk will get a deep view about: - Which is the minimal necessary pre-existing Know-How for trainees, students and teachers/lecturers in order to educate for learning, living and work (engineering, operating, interacting with ISoCPS? - What and How to learn ISoCPS? (Recommendations for graduated and post-graduate students, as well as for industrialists) - What and How to educate and teach ISoCPS? (Recommendations for trainees, educators, teachers, etc.). Lessons learned from own experience educating ICPS at Master Degree level. - Which should be the essential and unavoidable body of knowledge for building an educational curriculum for learning ISoCPS (presentation and discussion of an exemplary curriculum for achieving a Master of Sciences in Industrial Informatics with Specialization in Industrial Cyber-Physical Systems)? Biography: Prof. Dr.-Ing. Armando Walter Colombo joined the Department of Electrotechnical and Industrial Informatics at the University of Applied Sciences Emden-Leer, Germany, became Full Professor in August 2010 and Director of the Institute for Industrial Informatics, Automation and Robotics (I2AR) in 2012. Prof. Colombo worked also during 17 years (2001-2018) as Manager Director for Collaborative Innovation Projects and also as Edison Level 2 Group Senior Expert at Schneider Electric, Industrial Business Unit. Prof. Colombo received the BSc. on Electronics Engineering from the National Technological University of Mendoza, Argentina, in 1990, the MSc. on Control System Engineering from the National University of San Juan, Argentina, in 1994, and the Doctor degree in Engineering from the University of Erlangen-Nuremberg, Germany, in 1998. From 1999 to 2000 was Adjunct Professor in the Group of Robotic Systems and CIM, Faculty of Technical Sciences, New University of Lisbon, Portugal. During the last 15 years he has also been working as Invited Professor at the University of Loughborough and University of Warwick (UK), University of Tampere (Finland), ITMO University (Russia),

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	Universidad Tecnologica Nacional (UTN) (Argentina), BUAP (Mexico) Prof. Colombo has extensive experience in managing multi-cultural research teams in multi-regional projects. He has participated in leading positions in many international research and innovation projects related to the area of Industrial Informatics. His research interests are in the fields of industrial cyber-physical systems, industrial digitalization and system-of-systems engineering, Internet-of-Services, Industry 4.0-compliant solutions. He is member of the IEEE IES Administrative Committee (AdCom), member of the Fellow Committees of the IEEE IES, IEEE SMS and IEEE CS, and IES representative by the IEEE Systems Council. He is co-founder of three IEEE IES Technical Committees (i) on Industrial Agents, (ii) on Industrial Informatics and (iii) on Industrial Cyber-Physical Systems.
08:20-09:00	*Room 4* **Meet with Friends**
	Room 1 **Meet with Friends**
	Room 3 **Meet with Friends**
	Plenary Session Room **Meet with Friends**
	Room 2 **Meet with Friends**
09:00-10:30	*Room 1* **SS Advances in Data-Driven Fault Diagnosis and Fault-Tolerant Control for Industrial Systems I** Chairs: Dr. Hao Luo, Dr. Zhiwen Chen **Graph convolution network-based fault diagnosis method for the rectifier of the high-speed train** *Zhiwen Chen, Jiamin Xu, Haobin Ke, Xinyu Fan, Tao Peng* **A lightweight defense scheme for industrial data transmission against eavesdropping attacks and integrity attacks** *Yuchen Jiang, Shimeng Wu, Xueyan Zhao, Hao Luo, Xianling Li, Yunkai Wu* **A Reliable Underwater Computing System** *Mohammad Alsulami, Raafat Elfouly, Reda Ammar* **Data-Driven Process Monitoring Approach for Closed-Loop Cascade Systems** *Kuan Li, Hao Luo, Xianling Li, Yunkai Wu* **Diagnosis and Mitigation of Smart Cyber-Attacks on an Offshore Wind Farm Network Operator** *Hamed Badihi, Saeedreza Jadidi, Ziquan Yu, Youmin Zhang, Ningyun Lu* **A Data-driven Approach for Identification and Detection of Intermittent Faults** *Yuhong Na, Shichen Peng*
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	TT: Advanced Modeling, Control, and Optimization for Cyber Physical Systems I Chairs: Prof. Youmin Zhang, Dr. Kenan Yong **Integral Action Model Predictive Control with Actuator Fault Estimation** *Vinayak Deshpande, Youmin Zhang* **On Finite Time Sensor Scheduling for Remote State Estimation With Energy Constraint** *Jiang Wei, Dan Ye* **Robust Iterative Learning Control for Magnetically Levitated Planar Motor with Random Initial Error** *Tong Zheng, Xianze Xu, Xing Lu, Fengqiu Xu* **Load frequency control for cyber-physical microgrid via a relaxed quadratic convex framework** *Jing He, Yan Liang, Feisheng Yang* **Modeling and Stability Analysis of Linear Switched Systems Driven by Logical Dynamics** *Changxi Li, Lijuan Guo* **Finite-Time Performance Recovery Strategy-based NCE Adaptive Neural Control for Networked Nonlinear Systems against DoS Attack** *Kenan Yong, Mou Chen, Qingxian Wu*
	Room 2 **TT: ICPS Theory and Technologies I** Chairs: Dr. Ida Siahaan, Mr. Tianyu Tan **State and Output Feedback Control of Discrete-Time Periodic Systems with Dual Event-Triggering Mechanism** *Liu Yang, Tianyu Tan, Jianxing Liu, Ligang Wu* **Recommending Location for Placing Data Collector in the OPC Classic** *Abu H. Al Muktadir, Ida S. Siahaan, Kwasi Boakye-Boateng, Dongyang Xu, Ali A. Ghorbani* **A convex combination strategy in event-triggered robust MPC for linear discrete-time systems with bounded disturbances** *Li Deng, Zhan Shu, Tongwen Chen* **Switched Model Predictive Control with Scheduled Mode Transitions without Terminal Constraints** *Tianyu Tan, Songlin Zhuang, Yang Shi* **Controller-based IIoT infrastructure and enabling technologies: an overview for design configuration** *Omogbai Oleghe*
09:00-11:00	*Plenary Session Room* **S&YPA Session**
09:00-13:00	*Room 4* **Tutorial: Wider Applications of Industry 4 and Data Management in The (post) Corona Period** The emergence of the pandemic has caused the businesses to constrain the contact to the citizens. Upon the studies, the shutdown of the business caused the major progress in utilization of the industry 4 solutions and data management. We plan to present the different aspects of the technological solutions that will assist in the reconstruction of the business and industry in the (post) period of corona in this tutorial. We would try to keep the presentation at the modest level such that no deep background will be required for the interested students, researchers, and practitioners. Chairs: Dr. Navid Sadjadi, Prof. Behzad Moshiri
10:30-11:00	*Room 1*

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11:00-12:00

Room 1

SS: Cyber Physical Systems for Deformable Object Manipulation

Deformable Objects Grasping and Shape Detection with Tactile Fingers and Industrial Grippers *Pablo Malvido Fresnillo, Saigopal Vasudevan, Wael M. Mohammed, Jose L. Martinez Lastra, Gianluca Laudante, Salvatore Pirozzi, Kevin Galassi, Gianluca Palli*

Robotic Wires Manipulation for Switchgear Cabling and Wiring Harness Manufacturing *Kevin Galassi, Gianluca Palli*

Cross Media Routing and Clustering Algorithm for Autonomous Marine Systems *Jiannan Ding, Changhu Wang, Meiqiu Jiang, Shuisheng Lin, Haifen Yang*

A Cyber-Physical System for Clothes Detection, Manipulation and Washing Machine Loading *Alessio Caporali, Wendwosen Bellete Bedada, Gianluca Palli*

Room 3

SS: System Modeling, Analysis and Control for Automobile systems

Chairs: Prof. Meibao Yao, Prof. Fei Meng

A Kalman smoother based estimation approach for dynamic adjustment systems with irregularly missing output data *Shaohua Ding*

Design and experimental test of multi-functional intelligent vehicle for greenhouse *Fei Meng, Wendong Huang, Changjie Wu, Sai Wang*

Time Delay Characteristics Analysis of Pressure Dynamic Response on Electro-hydraulic Pressure Regulating valve *Fei Meng, Yanfei Ren, Junqiang Xi*

An Adaptive Backstepping-Based Controller for Trajectory Tracking of Wheeled Robots *Song Cheng, Haoming Liu, Meibao Yao*

Room 2

TT: ICPS Architectures

Chairs: Dr. Magnus Redeker

Towards a Digital Twin Platform for Industrie 4.0 *Magnus Redeker, Jan Nicolas Weskamp, Bastian Rössl, Florian Pethig*

Knowledge Graphs as Enhancers of Intelligent Digital Twins *Nada Sahlab, Simon Kamm, Timo Müller, Nasser Jazdi, Michael Weyrich*

Semantic Asset Administration Shells in Industry 4.0: A Survey *Sadeer Beden, Qiushi Cao, Arnold Beckmann*

Security certification experience for industrial cyberphysical systems using Common Criteria and IEC 62443 certifications in certMILS *Andreas Hohenegger, Gerald Krummeck, Janie Baños, Alvaro Ortega, Michal Hager, Jiri Sterba, Tomas Kertis, Petr Novobilsky, Jan Prochazka, Benito Caracuel*

12:00-13:00

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	Room 1 **Lunch Breakout Session**
	Room 3 **Lunch Breakout Session**
	Room 2 **Lunch Breakout Session**
13:00-14:30	*Room 1* **SS: New Machine Learning Methods for Prognostic and Health Management PHM** Chairs: Prof. Liang Guo, Prof. Bin Zhang **Remaining useful life prediction approach for rolling element bearings based on optimized SVR model with reliable time intervals** *Shouren Nie, Yuchen Jiang, Kuan Li, Hao Luo, Xianling Li, Yunkai Wu* **Bearing remaining useful life prediction based on optimized support vector regression model with denoising technique** *Sheng Cao, Yuchen Jiang, Hao Luo, Yanming Fu, Xianling Li, Yunkai Wu* **Time Frequency Feature Analysis of Rolling Bearing Fault Based on Deep Transfer Learning** *Jie Cui, Rui Zhou, Zhijian Wang* **A Transfer Learning Based Method for Incipient Fault Detection** *Changgen Li, Liang Guo, Hongli Gao, Junhao Yang, Xun Dong, Zhichao You* **Uncertainty Analysis in the Application of Fault Diagnosis and Prognosis** *Dongzhen Lyu, Guangxing Niu, Tao Yang, Gang Chen, Bin Zhang* **A Deep Residual Convolutional Neural Network based Bearing Fault Diagnosis with Multi-sensor Data** *Guangxing Niu, Enhui Liu, Bin Zhang, Golda Michael, Stephen Mastro*
	Room 3 **SS: Distributed Control and Coordination for Constrained Cyber Physical Networks I** **Nonparametric Adaptive Trajectory Tracking Control of Uncertain Euler-Lagrange Systems** *Meiqi Tang, Junjie Fu* **Distributed Consensus with Private Communications** *Lina Rong* **Distributed Robust Nash Equilibrium Seeking by Unknown Dynamics Estimator based Approaches** *Danhu Li, Maojiao Ye* **On Appointed-time Reduced-order Observer-based Consensus Protocol Design for Lipschitz Nonlinear Multi-agent Systems** *Tianqi Liu, Miaosen Zhang, Yuezu Lv, Guanghui Wen, Guohua Liu* **A Class of Optimal Control Problem for Stochastic Discrete-Time Systems with Average Reward Reinforcement Learning** *Yifan Hu, Junjie Fu, Yuezu Lv* **Energy Scheduling Strategy of Ice Storage Air Conditioning System Based on Deep Reinforcement Learning** *Diandian Wan, Ming Chi, Qing Peng, Yunfan Yu, Zhi-Wei Liu*
	Room 2 **TT: ICPS Applications I** **Cyber-physical System based Cooperative Maneuver Planning for**

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	Multiple Tractor-trailer Vehicles in a Cluttered Environment *Bai Li, Youmin Zhang, Ming Yue, Xiaoyan Peng, Xiang Zhong, Qi Kong* **Relative State Formation-based Warehouse Multi-robot Collaborative Parcel Moving** *Sil Kwong Tse, Yik Ben Wong, Jiawei Tang, Peihu Duan, Suk Wai Winnie Leung, Ling Shi* **Material identification for smart manufacturing systems: a review** *Benjamin Lutz, Dominik Kisskalt, Daniel Regulin, Tobias Hauser, Jörg Franke* **Utilising Web-based Digital Twin to Promote Assembly Line Sustainability** *Fadi Assad, Sergey Konstantinov, Mus'ab Ahmad, Emma Rushforth, Robert Harrison* **Lightweight Combinational Machine Learning Algorithm for Sorting Canine Torso Radiographs** *Masuda A. Tonima, Fatemeh Esfahani, Austin DeHart, Youmin Zhang*
14:30-15:00	*Room 4* **Meet with Friends**
	Room 1 **Meet with Friends**
	Room 3 **Meet with Friends**
	Plenary Session Room **Meet with Friends**
	Room 2 **Meet with Friends**
15:00-16:00	*Plenary Session Room* **Keynotes: Prof. Xinghuo Yu - Engineering Cyber-Physical Systems: A Nature-Inspired Simplexity Approach** Abstract: Cyber-Physical Systems (CPS) represent a broad range of complex, physically aware engineered systems which integrate information and communication technologies (ICT) into physical systems for efficient and effective automation and control. A typical example is a smart grid which allows affordable and secure power supply and use while helping reduce carbon footprints. Recent fast ICT advances have made situation awareness possible for better management and operation of CPS. This has also led to explosive growth of spatio-temporal information and complexity. An innovative way of thinking and doing is needed to tackle these large-scale complex problems efficiently and effectively. In this talk, we will first review recent developments in CPS and their challenges. We will then advocate a novel problem-solving paradigm, the so-called simplexity approach underpinned by a ‘simple solutions for complex problems’ philosophy, to deal with large-scale complex CPS. Several nature-inspired methodologies such as AI, swarm intelligence and complex networks will be examined. Challenging issues for the simplexity approach for CPS will

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be outlined. Some real-world problems, such as money laundering network detection and autonomous microgrid network for power supply from our own research projects, will be used as case studies.

Biography:
Distinguished Professor Xinghuo Yu is an Associate Deputy Vice-Chancellor and a Vice-Chancellor's Professorial Fellow at RMIT University (Royal Melbourne Institute of Technology), Melbourne, Australia. He is also the Junior Past President of IEEE Industrial Electronics Society. His main research areas include control systems engineering, intelligent and complex systems, and future energy systems. He received many awards and honours for his contributions, including the 2018 MA Sargent Medal from Engineers Australia, the 2018 Australasian AI Distinguished Research Contribution Award from Australian Computer Society, and the 2013 Dr.-Ing. Eugene Mittelmann Achievement Award from IEEE Industrial Electronics Society. He was one of the 15 Shortlist Nominees for the 2020 Global Energy Prize and named a Highly Cited Researcher by Clarivate Analytics in 2015-2020 consecutively. He is a Fellow of IEEE, Engineers Australia, Australian Computer Society, and Australian Institute of Company Directors.

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07:00-08:00

Plenary Session Room

Keynotes: Prof. Bin Liang - Space Robots: from Rigid Manipulators to Flexible Ones

Abstract:
Space robotics is known as an inter-discipline research area that has close ties with advanced manufacturing, information and communication technology, and intelligent control. Although it serves as a promising and powerful tool to diverse aero-space applications including spacecraft repair and maintenance, space junk clean-up, and large space system construction, there are also great challenges. In this report, we will firstly summarize the current status and the prospects of the space robot technique along with its applications in on-orbit servicing. Then the technical challenges and new research findings of freefloating space robots are introduced. Finally, we cover the technical difficulties and progress of the next-generation flexible thin and long space manipulator which has strong motion capacity.

Biography:
Prof. Bin Liang was born in 1968, Jiangxi Province, China. He was recommended for admission to the 1st "Educational Reform Pilot Class" in Northwestern Polytechnical University, Xi'an, China, where he received B.Sc and M.Sc degrees in control engineering in 1988 and 1991, respectively. He received the Ph.D degree in precision instruments from Tsinghua University, Beijing, China in 1994. From Dec. 1994 to Oct. 2007, he worked as a researcher with China Aerospace Science and Technology Corporation(CASC). In Nov. 2007, he joined Tsinghua University (THU), Beijing, China, where he is currently a Professor with the Department of Automation and the leading director of Institute of Navigation and Control. His research interests include Robotics, Teleoperation, Intelligent Control, etc.

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	Since 2007, he has been the Chief Expert in the intelligent robot of National Hi-tech Research and Development Program of China (known as 863 Program). He was a Senior Research Fellow at Chinese University of Hong Kong, China, and a Senior Researcher with EADS Transportation, Astrium, Germany. He was also a visiting scholar at Carnegie Mellon University (CMU), USA. He is now vice Directing Member of China Society of Image and Graphics and was ever vice Directing Member of Chinese Society of Astronautics. He has authored and co-authored 2 books, 2 Book Chapters, 30 Patents and more than 50 research papers. He was awarded three first-class prizes for provincial and ministerial level scientific and technological progress (2014, 2012 and 2007), and one Supreme Prize for National Science and Technology Progress Award (2015).
08:00-09:00	*Plenary Session Room* **Keynotes: Prof. Tongwen Chen - Intelligent Alarm Monitoring of Complex Industrial Processes** Abstract: In operating industrial facilities, alarm systems are configured to notify operators about any abnormal situation. The industrial standards (EEMUA and ISA) suggest that on average an operator should not receive more than six alarms per hour. This is, however, rarely the case in practice as the number of alarms each operator receives is far more than the standard. There exist strong industrial needs and economic benefits for better interpreting and managing the alarms, and redesigning the alarm systems to reduce false and nuisance alarms, and increase the alarm accuracy. In this talk, we plan to summarize our recent work in this new area, targeting an intelligent and data-based approach, called “alarm analytics,” and presenting a new set of advanced tools for alarm visualization, performance evaluation and analysis, alarm rationalization design, alarm flood classification, and root cause analysis, thereby to help industrial processes to comply with the new standards. The tools have been tested with real industrial data and used by process engineers in Canada and elsewhere. Biography: Tongwen Chen is currently a Professor and Tier 1 Canada Research Chair in Intelligent Monitoring and Control at the University of Alberta, Canada. He received the BEng degree in Automation and Instrumentation from Tsinghua University (Beijing) in 1984, and the MASc and PhD degrees in Electrical Engineering from the University of Toronto in 1988 and 1991, respectively. His research interests include computer and network based control systems, event triggered control, process safety and alarm systems, and their applications to the process and power industries. He is a Fellow of IEEE, IFAC, as well as Canadian Academy of Engineering.
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	Room 3 **Meet with Friends**
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09:30-11:00	*Room 4* **SS: Distributed Cyber Physical Systems and Application I** Chairs: Prof. Mingxi Liu **Cyber-physical production systems for SMEs – A generic multi agent based architecture and case study** *Hicham Najjari, Matthias Seitz, Emanuel Trunzer, Birgit Vogel-Heuser* **Distributed Robust Finite-Time Containment Control of Euler-Lagrange Systems** *Zipeng Huang, Robert Bauer, Ya-Jun Pan* **An Improved Theta*-based Trajectory Planner for Autonomous Vehicle With Obstacle Avoidance** *Haiyang Yu, Xin Wang, Weichao Sun* **Sampled-Data-Based Consensus of Distributed Multi-Agent Systems Under DoS Attacks** *Jiayu Li, Fang Fang, Yajuan Liu, Yuanye Chen* **Consensus and Reputation-Based Resilient Control of Networked Microgrids** *Mohammadreza Hallajiyan, Hossein Hassani, Roozbeh Razavi-Far, Mehrdad Saif*
	Room 1 **SS: Advanced Control for Autonomous Vehicles I** Chairs: Prof. Zhuo Zhang, Prof. Huiping Li **Feasibility Enhancement of Constrained Receding Horizon Control Using Generalized Control Barrier Function** *Haitong Ma, Xiangteng Zhang, Shengbo Eben Li, Ziyu Lin, Yao Lyu, Sifa Zheng* **Dynamic positioning based on Sliding Mode Output Feedback of Unmanned Marine Vehicles with Unknown Membership Functions** *Li-Ying Hao, Li-Han Zhou, Han Gao* **Leader-follower formation control of mutilple UAVs based on ADRC: experiment research** *Hang Li, Jing Wang, Cunwu Han, Meng Zhou, Zhe Dong* **Reinforcement Learning based Multistage Optimal PMU Placement Against Data Integrity Attacks in Smart Grid** *Zhuorui Wu, Liang He, Sheng Li, Huihui Zhang, Shaoyi Hu, Meng Zhang, Xiaohong Guan* **Task allocation approach for underwater gliders in complex underwater missions** *Le Li, Xinbo Zhang* **Partially Integrated Guidance and Control of Quadrotors Subject to Multiple Uncertainties** *Yijia Xie, Xiang Yu, Jianzhong Qiao, Lei Guo, Yang Shi, Jianwei Xu*
	Room 3 **TT: ICPS Theory and Technologies II** Chairs: Dr. Jun Shang, Dr. Peter Langendörfer **Optimal Linear FDI Attacks with Side Information: A Comparative Study** *Jing Zhou, Jun Shang, Tongwen Chen*

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Anomaly Detection for Injection Molding Using Probabilistic Deep Learning *Vili Ketonen, Jan Olaf Blech*
SMT-Based Deployment Calculation for IEC 61499 Control Applications *Tuojian Lyu, Jan Olaf Blech, Valeriy Vyatkin*
Attack Reconstruction for a Class of Cyber-physical Systems with Altering Load *Kunpeng Pan, Feisheng Yang, Zhaowen Feng, Quan Pan*
Patch Now and Attack Later - Exploiting S7 PLCs by Time-Of-Day Block *Wael Alsabbagh, Peter Langendörfer*
Power Passports for Fault Tolerance: Anomaly Detection in Industrial CPS Using Electrical EFB *Uraz Odyurt, Julius Roeder, Andy D. Pimentel, Ignacio Gonzalez Alonso, Cees de Laat*

Room 2

TT: ICPS Applications II

Chairs: Prof. Chi Xu, Ms. Qian Zhang

A Novel Multi-Warehouse Mobile Robot Hierarchical Scheduling Strategy Based on Industrial Cyber-Physical System *Yindong Lian, Wei Xie, Qifan Yang, Langwen Zhang, Danqi Lin, Yajing Zhou*
Digitizing a Distributed Textile Production Process using Industrial Internet of Things: A Use-Case *Michael Rath, Aymen Gannouni, Daniel Luetticke, Thomas Gries*
Iterative Learning Based Decentralized Model Predictive Charging Control For Plug-In Electric Vehicles *Qian Zhang, Yang Shi, Kui Wu*
Implementation of Impedance Control for Lower-Limb Rehabilitation Robots *Yujian Zhou, Jinhua She, Zhen-Tao Liu, Chi Xu, Zhaohui Yang*
Estimating Human Pose with both Physical and Physiological Constraints *Lei Su, Jinhua She, Chi Xu*

09:30-11:30

Plenary Session Room

Best Conference Paper Award Session

Day-ahead Mobility-aware Power Trade Planning and Real-time MFG-based Charging Control Scheme for Large-scale EVs *Kai Zhao, Fuguo Xu, Qiaobin Fu, Tielong Shen*
Distributed Algorithm with Resilience for Multi-Agent Task Allocation *Xuan Wang, Jeffrey Hudack, Shaoshuai Mou*
Investigating the Applicability of In-Network Computing to Industrial Scenarios *Ike Kunze, René Glebke, Jan Scheiper, Matthias Bodenbenner, Robert H. Schmitt, Klaus Wehrle*
Visual Programming of a Human-Machine Interface for a Multi-Robot Support System *Alberto Sartori, Christian Schlette*
A Novel Cryptography-Based Privacy-Preserving Decentralized Optimization Paradigm *Xiang Huo, Mingxi Liu*
A Security Scoring Framework to Quantify Security in Cyber-Physical Systems *Andreas Aigner, Abdelmajid Khelil*

11:00-11:30

Room 4

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11:30-12:45

Room 4

TT: ICPS Theory and Technologies III

Chairs: Prof. Oliver Niggemann

- **Gradient-based Reconfiguration of Cyber-Physical Production Systems** *Kaja Balzereit, Oliver Niggemann*
- **CoSiNeT: A Lightweight Clock Synchronization Algorithm for Industrial IoT** *Rahul Nandkumar Gore, Elena Lisova, Johan ÅKerberg, Mats Björkman*
- **Transforming OPC UA Information Models into Domain-Specific Ontologies** *Gernot Steindl, Wolfgang Kastner*
- **Extending Reference Broadcast Infrastructure Synchronization Protocol in IEEE 802.11 as Enabler for the Industrial Internet of Things** *Michael Gundall, Christopher Huber, Sergiy Melnyk, Hans Dieter Schotten*
- **Securing Remote Access Networks Using Malware Detection Tools for Industrial Control Systems** *Okechukwu Ude, Bobby Swar*

Room 1

SS Autonomous Shipboard and Energy Systems I

Chairs: Prof. Xiaofei Yang, Prof. Seiji Hashimoto

- **Coverage Optimization of Mobile Sensor Networks Based Improved Beetle Antennae Search Algorithm** *Huanxiao Liu, Dapeng Song, Jun Wang, Xiaofei Yang, Wei Liu, Hui Ye*
- **Time-Delay Temperature Control System Design based on Recurrent Neural Network** *Yuan Liu, Song Xu, Shinya Kobori, Seiji Hashimoto, Takahiro Kawaguchi*
- **Online Learning Algorithm-Based High-Efficient Control of IPM motors** *Ting Yang, Ryosuke Honda, Takahiro Kawaguchi, Seiji Hashimoto, Song Xu, Masayuki Kigure, Makoto Shibuya*
- **An Improved RBF Neural Network based on Clustering Algorithm for Estimating Wind Speed from X-band Marine Radar Images** *Hui Wang, Dongyang Fan, Haiyang Qiu, Zhiyu Zhu, Pengfei Zhi, Wanlu Zhu*
- **Research on Unmanned Ship Route Planning Based on DGWW Algorithm** *Huikai Meng, Pengfei Zhi, Wanlu Zhu, Haiyang Qiu, Hui Wang, Yunkai Wu*

Room 3

TT: ICPS Engineering I

Chairs: Dr. Shaoshuai Mou

- **Supporting Maintenance of Variant-Rich Automated Production Systems by Tracing of Variable Signal Paths in Electrical CAD** *Simon Ziegltrum, Birgit Vogel-Heuser, Kathrin Land*
- **Gaining IIoT insights by leveraging ontology-based modelling of raw data and Digital Shadows** *Christian Brecher, Melanie Buchsbaum, Aleksandra Mueller, Katrin Schilling, Markus Obdenbusch, Stefan Staudacher, Mohammed Chaikh Albasatineh*
- **A Situated Cognition Model for CPPS Testing** *Udo Kannengiesser, Florin Krenn, Christian Stary*

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Multi-Discipline Fault Modeling with Verilog-AMS *Nicola Dall'Ora, Enrico Fraccaroli, Sara Vinco, Franco Fummi*

Room 2

SS: Advances in Data-Driven Fault Diagnosis and Fault-Tolerant Control for Industrial Systems II

Chairs: Dr. Ayan Banerjee, Prof. Wei Xie

FaultEx: Explaining operational changes in terms of design variables in CPS control code *Ayan Banerjee, Imane Lamrani, Sandeep Gupta*

Research on Inconsistency Identification of Lithium-ion Battery Pack Based on Operational Data *Da Lin, Zhihao Li, Yibin Feng, Xiangjin Wang, Shuowei Li*

Dynamic Group Decision Support Models for Locating Faults in Power Systems *Hossein Hassani, Roozbeh Razavi-Far, Mehrdad Saif*

On designing cyber-physical-social systems with energy-neutrality and real-time capabilities *Mohamed Irfanulla Mohamed Abdulla, Maryline Chetto, Audrey Queudet, Lamia Belouaer*

Digital Twin based What-if Simulation for Energy Management *Flávia Pires, Bilal Ahmad, António Paulo Moreira, Paulo Leitão*

Wednesday, 12 May 2021

07:00-08:00

Plenary Session Room

Industry Forum: Digital Health

7:00 AM - 7:20 AM
-Invited Speech: "Developing a Wearable Medical Device to Identify Silent AFIB"
Prof. Mark Wehde (Mayo Clinic)

7:20 AM - 7:40AM
-Invited Speech: "Smart Systems for Ubiquitous Healthcare - AI is a Key Enabler"
Prof. Jamal Dean (McMaster University)

7:40 AM - 8:00AM
-Invited Speech: "Activity Monitoring Using Smart Visual Sensor"
Dr. Jie Liang (AltumView Systems)
Chairs: Prof. Michael Condry, Dr. Chao Shen

08:00-09:00

Plenary Session Room

Industry Forum: Industrial Automation and Wireless

8:00 AM - 8:20 AM
-Invited Speech: "Safe and Intelligent Mining Technologies"
Dr. Shahram Tafazoli (Motion Metrics, Inc.)

8:20 AM - 8:40AM
-Invited Speech: "Magnetic Levitation for Adaptive Manufacturing"
Dr. Xiaodong Lu (Planar Motors Inc)

8:40 AM - 9:00AM
-Invited Speech: "A Secure Wireless and 5G IoT Solution"
Mike Cawley, Rohit Prabhakar (Xrossfire)

Wednesday, 12 May 2021

	Chairs: Dr. Allen Chen, Dr. Victor Huang
09:00-09:30	*Room 4* **Meet with Friends**
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	Room 2 **Meet with Friends**
09:30-11:00	*Room 4* **SS: Resilient and Swarm Cooperative Control of Complex Cyber Physical Systems** Chairs: Prof. Ya-Jun Pan, Prof. Bin Zhang **Automated GPC tuning based on fuzzy logic and event triggered mechanism** *Ning He, Gongbo Xu, Mengrui Zhang* **Wide-area Damping Control for Cyber-Power Systems With Dynamic Event-triggered Mechanism** *Zhaowen Feng, Feisheng Yang, Zhengtian Wu, Quan Pan* **Optimal Formation Control for A Quadrotor Team under Switching Topologies via Reinforcement Learning** *H. Liu, W. Zhao, J. Xi* **Swarm cooperative control of heterogeneous industrial cyber-physical systems: a distributed observer approach** *Bohui Wang, Bin Zhang, Xinpeng Fang, Yu Zhao* **Teleoperated Single-Master-Multiple-Slave System for Cooperative Manipulations in Task Space** *Henghua Shen, Ya-Jun Pan, Lucas Wan* **Event-Triggered Bipartite Consensus of Multi-Agent Systems With Selected Transmissions** *Xiaodan Zhang, Feng Xiao, Bo Wei*
	Room 1 **SS Emerging Trends in Modelling and Control of Cyber Physical Energy Systems** Chairs: Dr. Amro Alsabbagh **Electric Vehicle Charging Navigation Strategy Considering Multiple Customer Concerns** *Amro Alsabbagh, Zhikang Li, Chengbin Ma* **Fast Distributed Stochastic Scheduling for A Multi-Energy Industrial Park** *Dafeng Zhu, Bo Yang, Zhaojian Wang, Chengbin Ma, Kai Ma, Shanyin Zhu* **Simplified Tree-Based MPC for the Cyber-Physical System with Jamming Attacks** *Yadi Xu, Yuchi Cao, Qi Liu, Tieshan Li, Qihe Shan* **A Cloud-Based Energy Management Framework with Local Redundancy Control Capability** *Zhikang Li, Amro Alsabbagh, Chengbin Ma* **Component Based Framework for Designing and Validating**

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Asynchronous Algorithms for Electrical Measurement and Protection *Louis Bonicel, Roland Bohrer, Benoit Leprettre, Frédéric Pétrot, Frédéric Rousseau*

Reactive Power Optimization for Voltage Stability in Energy Internet Based on Graph Convolutional Networks and Deep Q-learning *Sheng Guo, Junwei Cao*

Room 3

TT: ICPS Applications III

An Active Transfer Learning (ATL) Framework for Smart Manufacturing with Limited Data: Case Study on Material Transfer in Composites Processing *Milad Ramezankhani, Apurva Narayan, Rudolf Seethaler, Abbas S. Milani*

California Oilfield Underground Aquifer Injection Monitoring by Blockchain Technology *Jonathan Crawford, Andrew Folsom, Vananh Vo, Angela Tante, John Yu, Chengwei Lei*

Modeling of Security Risk for Industrial Cyber-Physics System under Cyber-attacks *Ziwen Sun, Shuguo Zhang*

A Novel Non-maximum Suppression Algorithm Based on Affinity Propagation Clustering *Guangyuan Xu, Shuangxi Huang*

Graph Laplacian Extended Kalman Filter for Connected and Automated Vehicles Localization *Nikos Piperigkos, Aris S. Lalos, Kostas Berberidis*

Room 2

TT: ICPS Theory and Technologies IV

Chairs: Prof. Oliver Niggemann, Prof. Dawei Shi

A Generic DigitalTwin Model for Artificial Intelligence Applications *Oliver Niggemann, Alexander Diedrich, Christian Kühnert, Erik Pfannstiel, Jushua Schraven*

Detection of Dataset Shifts in Learning-Enabled Cyber-Physical Systems using Variational Autoencoder for Regression *Feiyang Cai, Ali Ozdagli, Xenofon Koutsoukos*

Accelerating deep neural networks for efficient scene understanding in automotive cyber-physical systems *Stavros Nousias, Erion Vasilis Pikoulis, Christos Mavrokefalidis, Aris Lalos*

Deep Neural Network Pipelines for Multivariate Time Series Classification in Smart Manufacturing *Parshin Shojaee, Yingyan Zeng, Xiaoyu Chen, Ran Jin, Xinwei Deng, Chuck Zhang*

Multiple Motors Collaborative Motion of Cyber-Physical System under DoS Attack *L.C. Dai, L. Qiu, M. Najariyan, J.F. Pan*

IoT-enabled Intelligent Dynamic Risk Assessment of Acute Mountain Sickness Based on Data from Wearable Devices *Jing Chen, Yuan Tian, Guangbo Zhang, Zhengtao Cao, Lingling Zhu, Dawei Shi*

09:30-13:00

Plenary Session Room

Tutorial: Ensuring Safety and Establishing Trust for AI enabled Cyber-Physical Systems

Chairs: Prof. Sandeep K.S. Gupta

11:00-11:30

Room 4

Meet with Friends

Room 1

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	Meet with Friends
	Room 3 **Meet with Friends**
	Room 2 **Meet with Friends**
11:30-12:15	*Room 3* **SS: Operational Safety Verification of Cyber Physical Industry 4.0 Applications** **An Interaction Strategy for Safe HumanCo-Working with Industrial Collaborative Robots** *Juan Alberto García Esteban, Luis Piardi, Paulo Leitão, Belén Curto, Vidal Moreno* **Realization of a Model-Based DevOps Process for Industrial Safety Critical Cyber Physical Systems** *Smitha Gautham, Athira Varma Jayakumar, Abhi D. Rajagopala, Carl Elks* **Impact of Automotive System Safety Design on Machine Learning Based Perception Systems** *Vasu Singh, Mandar Pitale*
11:30-12:45	*Room 4* **TT: Advanced Modeling, Control, and Optimization for Cyber Physical Systems II** Chairs: Dr. Xinxin Shang **Path following control of a quadrotor using dynamic extension with a well-designed stopping policy** *Chunhui Zhao, Dong Wang, Qun-e Zhao, Jinwen Hu, Quan Pan* **Scenario-based Model Predictive Control for Path Planning and Obstacle Avoidance** *Xinxin Shang, Jicheng Chen, Songlin Zhuang, Yang Shi* **WindNode: A Long-Lasting And Long-Range Bluetooth Wireless Sensor Node for Pressure and Acoustic Monitoring on Wind Turbines** *Raphael Fischer, Hanna Mueller, Tommaso Polonelli, Luca Benini, Michele Magno* **Research on SOC Estimation of Li-ion Battery Based on Adaptive Extended Kalman Filter** *Zhengjie Zhang, Mingyue Wang, Rui Cao, Hanchao Cheng, Xinlei Gao, Shichun Yang* **Hierarchical Clustering Detection Based Secure Fusion Filtering for Multiple False Data Injection Attacks** *Xiaoliang Feng, Jingjing Yan, Jian Zheng, Yaguang Guo*
	Room 1 **TT: ICPS Engineering II** Chairs: Dr. Chao Shen **Understand and Control Complexity in Cyber-Physical Systems by Analyzing Complexity Drivers** *Michael Riesener, Christian Dölle, Alexander Keuper, Günther Schuh* **Design patterns for the implementation of Industrial Agent-based AASs** *Alejandro López, Oskar Casquero, Marga Marcos* **Developing Web-based Digital Twin of Assembly Lines for Industrial Cyber-physical Systems** *Sergey Konstantinov, Fadi Assad, Wajid Azam, Daniel Vera, Bilal Ahmad, Robert Harrison* **Functional Safety Hazards for Machine Learning Components in**

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Autonomous Vehicles *Kaushik Madala, Hyunsook Do*

Performance Assessment Index in Continuous Annealing Processes by Extracting Reference Curve of Operating Modes *Wenshuo Song, Weihua Cao, Wenkai Hu, Yan Yuan, Min Wu*

Room 2

SS: Autonomous Shipboard and Energy Systems II

Chairs: Prof. Wei Jiang

A Distributed Hybrid Control Framework for Shipboard Power System Reconfiguration *Wanlu Zhu, Zhengzhuo Liang, Zhiyu Zhu, Pengfei Zhi*

Path Planning of Unmanned Surface Vehicle Based on A* Algorithm Optimization Considering the Influence of Risk Factors *Aogang Wang, Pengfei Zhi, Wanlu Zhu, Haiyang Qiu, Hui Wang, Weiran Wang*

Duty Cycle Optimization for Blood Pressure Sensors in Wireless Body Area Networks Based on Reinforcement Learning *Lili Wang, Siyao Xi, Wei Liu, Qilin Zhou*

Battery Energy Storage Converter for Shipboard Energy Magazine System *Jieyun Wang, Wei Jiang, Barry W. Williams*

Design of a Novel High-Power Density Negative Ion Virus Destructor for Confined Shipboard Space *Yifan Wu, Haibo Liu, Xiaoqi Xu, Wei Jiang*