

Zhibo Pang

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Google Scholar: <https://scholar.google.com/citations?user=S14M7yMAAAAJ&hl=en>



PROFILE

I am a passionate innovator and research leader in digital transformation of industry with 20-year experiences at universities, large company, and start-ups. Spanning the entire innovation procedure, I have been playing the roles of visionary leader, concept creator, resource investigator, cross-organizational coordinator, technical mentor, hardcore coder, product manager, and customer communicator. I work on enabling technologies in artificial intelligence, robotics, control, computing, communication, and electronics for Industry4.0 and Healthcare4.0.

Keywords: Industry4.0, Healthcare4.0, Internet-of-Things, Cyber Physical Systems, WirelessHP, Cloud-Fog Automation, Machine Learning/AI, Cloud/Edge Computing, Control System, Robotics, Wireless communication, Cybersecurity, Functional Safety, System-on-Chip, FPGA/ASIC, Process automation, Power grids, Biomedical Informatics

Facts: 24 granted patents, 100+ journal papers, 50+ conference papers, 30+ invited talks, 2 edited proceedings, Google Scholar citation 6000+, h-index 40

EDUCATION

PhD (Electronic and Computer Systems), KTH Royal Institute of Technology, Stockholm, Sweden, 2013.7

MBA (Innovation and Growth), University of Turku, Turku, Finland, 2012.10

EU-China Managers Exchange and Training Program (METP), studied business administration courses at the business schools of China-Europe International Business School (Shanghai, China), Manchester Metropolitan University (Manchester, UK), ESCP Europe Paris (Paris, France), and Solvay Brussels School of Economics and Management of the Université Libre de Bruxelles (Brussels, Belgium), 2010.5 -2010.10,

B.Eng (Electronic Engineering), Zhejiang University, Hangzhou, China, 2002.6

INDUSTRIAL EXPERIENCE

Senior Principal Scientist (2019.10-present), **Principal Scientist** (2017.8-2019.9), **Senior Scientist** (2016.1-2017.7), **Scientist** (2013.07-2015.12), **Associate Scientist** (2011.8-2013.07), ABB Corporate Research, Vasteras, Sweden

- Currently holding the highest specialist title (Senior Principal Scientist) in industrial communication, appointed by global CTO, formulating strategy, and mentoring the R&D activities globally in this area
- Currently leading the research on cloud/edge/5G/6G-enabled and AI-powered automation system and robotics solutions with extensive collaborations with leading ICT vendors (E, I, C, M as first letter of name), ongoing, limited public information
- Led the research on communication architecture, protocols, device interfaces, and cloud software for next generation process automation and DCS solutions with cloud-friendly and open infrastructure in 2022.
- Led the research on reliable and scalable Industrial IoT and cloud service architecture, protocols, and software for new generation electrical drives and motors in 2022.
- Made major contributions to ABB's 5G strategy and defined roadmap for the Connected Systems technology area in 2021
- Led the research on communication and computing architecture and wireless safety for service robots, demonstrated in ABB Mobile YuMi in 2019
- Led the Innovation Big Bets on Smart Logistics – Automation Track, enabled partnership with ABB's strategic customers JD.COM in e-commerce and logistics industry in 2018

- Led the research of high-performance wireless communications (WirelessHP) for critical control systems with microsecond level latency in 2017, far beyond the start-of-the-art, contributed key patents to the ABB Tropos Wireless Mesh portfolio, contributed disruptive technologies for the ABB HVDC (high voltage direct current) business in 2018 (now Hitachi Energy), impacted 6G (Nokia), WiFi6/7 (Intel), and follow-up research at top universities (MIT, UC Irvine, UPenn, Oxford, Caltech, etc.)
- Led the research on natively IP based communication for building automation, productized in the ABB free@home smart building solution in 2016 and Welcome IP door entry system in 2017.
- Developed one of the earliest functional implementations of WirelessHART stack for industrial wireless sensor networks in 2012

Start-up Entrepreneur/Co-founder, Shanghai Shengyue Electronics Tech Co. Ltd. (China, 2007.7-2008.7), and Ambigua Medito AB (Sweden, 2008.8-2009.9)

- Led start-up team of 10+ engineers, developed application processor SoC (system-on-chip) with Linux OS and multi-standard high-definition video decoder (H.264, MPEG4, RMVB, etc.) for personal multimedia player in 2008
- Developed network-on-chip (NoC) research platform using FPGA which can implement 64 ARM9 CPU cores in 2009

Department Manager (2004-2007.07), Project Leader and Product Manager (2003-2004), Chip Design Engineer (2002.07-2003), Nationalchip Sci&Tech Co. Ltd., Hangzhou, China

- Led R&D team of 80+ engineers, delivered one of the earliest single-chip DVB-S (digital video broadcast - satellite) receiver SoC (system-on-chip) in 2005 which had occupied a major share of global market, winning the “National Great Invention Award” awarded by the Ministry of Information Industry of China

ACADEMIC EXPERIENCE

Adjunct Professor (on Industrial IoT), School of Electrical and Information Engineering, University of Sydney, Sydney, Australia, 2019.2-present

Adjunct Professor (on Industrial Wireless Communication), Department of Intelligent Systems, KTH Royal Institute of Technology, Stockholm, Sweden, 2021.1-present,

Industrial Supervisor of PhD Student, University of Glasgow, Glasgow, UK, 2020.12-present

Affiliated Faculty, KTH Royal Institute of Technology, Stockholm, Sweden, 2018.01-2021.10

Industrial Supervisor of PhD Student, Linköping University, Linköping, Sweden, 2019.4-2021.6

Industrial Supervisor of PhD Student, Department of Physics, Stockholm University, Stockholm, Sweden, 2019.11-2020.06

International Advisor, Department of Industrial Engineering, Tsinghua University, Beijing, China, 2013-2018

Industrial Supervisor of PhD Students, Electric Engineering School, KTH Royal Institute of Technology, Stockholm, Sweden, 2015-2016

Adjunct Professor, Beijing University of Posts and Telecommunications (BUPT), Beijing, China. 2014-2018

PhD researcher, KTH Royal Institute of Technology, Stockholm, Sweden, 2007.12-2011.08

COMMERCIALIZATION OF RESEARCH RESULTS

[ABB Mobile YuMi](#)– new generation innovation platform for autonomous mobile robots

Disruptive innovations for [HVDC](#) (high-voltage direct current) power transmission solutions, (now Hitachi Energy, formerly ABB Power Grids)

[Tropos Wireless Broadband Networks](#) – high reliability low latency wireless network for mission-critical applications in power grids, mining, oil&gas, and city infrastructure (now Hitachi Energy, formerly ABB Power Grids)

[ABB-free@home](#) - Building and Home Automation Solution

[ABB Welcome IP](#) – video communication solution for residential and functional buildings

[ABB WirelessHART instrumentation](#) solutions for process industry

[NationalChip System-on-Chip](#) solutions for digital television and consumer electronics

HONORS,

Supervised master students, Sofie Nilsson and Anna Bengtsson, supervised by me and Alf Isaksson won the “Automation Student 2022” prize at the annual contest organized by the Automation Region, Swedish Fair, and Swedish Automation for their thesis on “Latency Aware and Event-Based Wireless Control for Cloud-Fog Automation”, Oct 18, 2022, Gothenburg, Sweden, [News and video](#), the citation of the award is: *“The winning entry presents a well-developed model for efficient wireless communication within the manufacturing industry. With scientifically based reasoning and practical tests, the authors contribute new knowledge that is valuable for the development of the future's cost-effective and powerful automation solutions.”*

PhD student, Honghao Lyu, won the Final List Award at the contest of IES-SYP (Students & Young Professionals) Contest, at the 48th Annual Conference of the IEEE Industrial Electronics Society (IECON2022), Oct 18-22, 2022, Brussels, Belgium, [video](#)

“2021 Inventor of the Year Award”, ABB Corporate Research Sweden

“2018 Inventor of the Year Award”, ABB Corporate Research Sweden

“2016 Inventor of the Year Award”, ABB Corporate Research Sweden

Outstanding Paper Award, for “An In-home Medication Management Solution Based on Intelligent Packaging and Ubiquitous Sensing” at the IEEE International Conference on Advanced Communications Technology (ICACT). Jan 2013, Pyeongchang, Korea

The First Place Prize of Competition, for “TouchMe System, a RFID Solution for Interactive Package” at the RFID Nordic EXPO 2008, Stockholm, Sweden

Second Level Award for Science and Technology of Zhejiang Province, Government of Zhejiang Province, China, 2006

New Century 131 Young Talent, Government of Hangzhou City, China, 2006

National Significant Invention Award (as No. 4 among the co-inventors), for the "Satellite/Cable Television Demodulator Chipsets GX1101/GX1001 ", eight projects were awarded country-wide in total, the Ministry of Information Industry of China, China, 2005

FOOTPRINTS IN MEDIA

My panel talk at the 5th IEEE Conference on Enterprise Systems (ES2017) was reported by many technical media and ABB official website. [Link1](#), [Link2](#), [Link3](#), [Link4](#)

My PhD work on “Fresh Food Tracker: Internet-of-Thing solution for food supply chain” was demonstrated in promotion video of KTH for international students, and reported by KTH website and many technical media in Sweden and China. [Link1](#), [Link2](#), [Link3](#), [Link4](#), [Link5](#), [Link6](#)

My PhD work on “TouchMe System, a RFID Solution for Interactive Package” won the First Place Prize of Competition of RFID Nordic EXPO 2008, and reported by KTH website and Elektronik Tidningen. [Link1](#), [Link2](#)

INDUSTRY FUNDED PROJECTS

Most of my research was funded by ABB internally. Project details cannot be provided in this public document.

PUBLIC FUNDED PROJECTS

PI, APR20-0023: Making the wireless critical control safe and resilient, funded by Swedish Foundation for Strategic Research (SSF), 1500000SEK, 2021.05-2027.04

Senior Member (responsible for strategy and IPR), PRJ-7646: ABB part of the H2020 project 5G SMART – 5G for smart manufacturing (<https://5gsmart.eu/>), 1500000USD, 2019.06-2021.12

PI, VINNOVA 2015-06548: Ultra-High Performance Wireless Communications for Industrial Applications, funded by Swedish Innovation Agency (VINNOVA), 190500SEK, 2016.01-2017.06

PI, VINNOVA 2017-02822: Ultra-Reliable Low Latency Wireless Communications for Industrial Digitalization, funded by Swedish Innovation Agency (VINNOVA), 296000SEK, 2017.08-2018.01

APPOINTMENTS IN ACADEMIC COMMUNITY

TC Co-Chair, IEEE IES Technical Committee on Industrial Informatics, 2017-present.

Committee Member, IEEE IES Industry Activities Committee, 2020-present

Member, Industrial Wireless Technical Working Group (IWSTWG), National Institute of Standards and Technology (NIST), U.S. Department of Commerce, 2017-present

Award Committee Member, IEEE Technical Committee on Cyber-Physical Systems, 2020-2020

Chair of Sub-TC, Sub-TC on Industrial Internet of Things Services and People, IEEE IES Technical Committee on Industrial Informatics, 2015-2020,

Vice-Chair of Sub-TC, Sub-TC on Internet of Things Optimization, IEEE IES Technical Committee on Cloud and Wireless Systems for Industrial Applications, 2015-2016,

EDITORIAL SERVICE

Associate Editor, IEEE Transactions on Industrial Informatics (TII), 2016-present.

Associate Editor, IEEE Journal of Biomedical and Health Informatics (JBHI), 2017-present.

Associate Editor, IEEE Journal of Emerging and Selected Topics in Industrial Electronics (JESTIE), 2019-present.

Guest Editor, IEEE Reviews in Biomedical Engineering (RBME), 2017-2018,

Guest Editor, Proceedings of the IEEE, SI on “Real-Time Networks and Protocols for Factory Automation and Process Control Systems”, 2018-2019,

Guest Editor, IEEE Internet of Things Journal, SI on “Low-latency High-reliability Communications for IoT”, 2018-2019,

Guest Editor, IEEE Transactions on Industrial Informatics, SS on “Developments in Artificial Intelligence for Industrial Informatics”, 2017-2018,

Guest Editor, IEEE Access, SI on “Key Technologies for Smart Factory of Industry 4.0”, 2017-2018,

Guest Editor, Wireless Communications and Mobile Computing (Wiley and Hindawi), SI on “Time-Critical Wireless Networks for Industrial Systems and Mobile Robotics”, 2017-2018:

Editorial Board, Journal of Management Analytics (Taylor & Francis), 2015-2018,

Editorial Board, Journal of Industrial Information Integration (Elsevier), 2015-2018,

Editorial Board, International Journal of Modeling, Simulation, and Scientific Computing (WorldScientific), 2017-2018,

STANDARDIZATION SERVICE

Founding Member, Working Group for IEEE P1451.5p: Standard for Radio Frequency Channel Specifications for Performance Assessment of Industrial Wireless Systems, 2021-present

Member, Working Group for IEEE P2805.1: Self-Management Protocols for Edge Computing Node, 2020-present

Member, Working Group for IEEE P2805.2: Data acquisition, Filtering and buffering Protocols for Edge Computing Node, 2020-present

Member, Working Group for IEEE P2805.3: Cloud-Edge Collaboration Protocols for Machine Learning, 2020-present

PUBLIC FUNDING ASSESSMENT

[Proposal Reviewer], a proposal on robot skin (details undisclosed), European Research Council (ERC) <http://erc.europa.eu>, 2021

[Proposal Reviewer], a proposal on high performance wireless communication (details undisclosed) aiming for NWA-ORC grant, Dutch Research Council (NWO) www.nwo.nl, The Netherlands, Feb 2020

[Proposal Reviewer], a proposal on industrial wired and wireless networks (details undisclosed) aiming for the National Fund for Scientific and Technological Development (FONDECYT), National Commission for

Scientific and Technological Research of Chili (CONICYT-Chile) <https://www.conicyt.cl/>, Chili, Sep 10, 2019

[Proposal Reviewer] a proposal on low latency wireless (details undisclosed) aiming for funding from The Centre for Industrial Information Technology (CENIIT) at Linköping University <https://liu.se/en>, Sweden, Sep 2017

PHD ASSESSMENT

Thomas Jacobsen, “Radio Resource Management for Uplink Ultra-Reliable Low-Latency Communications”, Aalborg University, Supervisor: Professor Preben Mogensen, Aug 23, 2019

Weilin Zang, “Research on Energy-Efficient Communication Scheme for Dynamic Characteristics of Wireless Body Area Network”, University of Chinese Academy of Sciences, Supervisor: Professor Ye Li, 2018

Xiaofan Mao, “Research on Intelligent Detection Methods for Arrhythmia and High-performance Implementation”, University of Chinese Academy of Sciences, Supervisor: Professor Ye Li, 2018

INVITED TALKS AT INTERNATIONAL CONFERENCES¹

[Keynote at Workshop] “Time Critical IoT for Industrial Automation: the Communication and System Perspectives”, Workshop on the Internet of Time-Critical Things at the IEEE 8th World Forum on Internet of Things (WF-IoT2022), 26 October–11 November 2022, Yokohama, Japan

[Invited Speaker] “Unobtrusive evaluation of latency and reliability of industrial wireless technologies”, Workshop on Industrial Wireless Technologies and Systems at the 48th Annual Conference of the IEEE Industrial Electronics Society (IECON2023) on October 17, 2022, Brussels, Belgium.

[Invited Speaker] “5G communication and computing for industrial control systems: where we are and directions”, Industry Forum (IF) at the 48th Annual Conference of the IEEE Industrial Electronics Society (IECON2023) on October 18 - 20, 2022, Brussels, Belgium.

[Invited Speaker] “Impulsive noise and interference in industrial wireless systems: A perspective of non-communication sources”, 31st IEEE International Symposium on Industrial Electronics (ISIE2022), June 1-3, 2022, online and Anchorage, Alaska, USA

[Invited Speaker] “New initiatives and challenges towards open architecture for process automation”, The 2nd International Summit on Industrial Intelligence, Jun 18-19, 2022, online and Shenyang, China

[Distinguished Lecture] “Cloud-Fog Automation: New trends in industrial automation powered by deterministic communication and computing”, 3rd International Forum on Frontiers of Automation and Artificial Intelligence (FAAI 2021), online and Nov 8-9, 2021, in Shenyang, China

[Invited Speaker] “New trends in communication and computing technologies towards the Cloud-Fog Automation”, the 30th IEEE International Symposium on Industrial Electronics (ISIE2021), online and Kyoto, Japan, June 20-23, 2021.

[Keynote at Workshop] “WirelessHP: towards the Ethernet-grade wireless for critical control in industrial automation”, IEEE International Conference on Communications (ICC2021) Workshop on Extreme URLLC Towards 6G Connectivity, 14-23 June 2021, online and Montreal, Canada

[Tutorial] “5G and Beyond for Robotics and Automation: Challenges and Opportunities”, The 2021 IEEE 93rd Vehicular Technology Conference (VTC2021-Spring), 25 - 28 April 2021.

[Distinguished Lecture] “5G for Industrial Automation and AI: Applications and Challenges”, 2nd International Forum on Frontiers of Automation and Artificial Intelligence (FAAI 2020), October 22-23, 2020, in Shenyang, China

[Tutorial] “Ultra-Reliable and Low-Latency Communications for Industry 4.0: Industrial and Academic Perspectives”, IEEE Global Communications Conference (Globecom2020), 8–10 December 2020, Taipei, Taiwan

[Keynote at Workshop] “Wireless for critical control in industrial systems: use cases, gaps, and research directions”, 2020 IEEE International Conference on Communications (ICC2020) Workshop on 5G Long Term Evolution and Intelligent Communication, Dublin, Ireland (changed to virtual), 7-11 June 2020

¹ Zhibo Pang has delivered over 35 invited presentations at events in 15 countries over 4 continents, including 6 fully funded keynotes and plenary addresses at international conferences. (2022-10)

- [Tutorial] “High performance wireless (WirelessHP) for critical control in industrial automation”, The IEEE 5G World Forum 2020, Bangalore, India (changed to virtual), Sep 10-12, 2020
- [Panel Talk] “High Performance Wireless Connectivity for Industrial Internet”, the 2nd IEEE International Conference on Industrial Internet (ICII2019), Orlando, USA, Nov 11-12, 2019
- [Panel Talk] “Industrial Communication and Edge Computing in the Era of AI”, The IEEE International Conference on Industrial Informatics (INDIN2019), Helsinki, Finland, July 23-25, 2019
- [Invited Talk] “Last Mile Connectivity: the Bottleneck of Mission Critical Industrial IoT”, Workshop on Reliable and High Performance Wireless Systems for Factory Automation at the IEEE 28th International Symposium on Industrial Electronics (ISIE2019), Vancouver, Canada, June 13-14, 2019
- [Invited Talk] “Last Mile Connectivity for Critical Industrial IoT: to Close the Loop from Big Data to Big Value”, Data Innovation Summit 2019, Stockholm, Sweden, Mar 14-15, 2019
- [Keynote] “Last Mile Connectivity: the Bottleneck of Critical Industrial IoT”, The 19th Australian Communications Theory Workshop (AusCTW), Sydney, 6-8 February 2019.
- [Invited Speaker] “Closed-Loop Sensing, Actuation and AI for Eldercare Robotics”, Gordon Research Conference on Advanced Health Informatics (GRC-AHI2018), June 17, 2018 - June 22, 2018, Hong Kong, China.
- [Panel Talk] “WirelessHP (High Performance): A New Target of Industrial Wireless for Control”, IEEE Wireless Communications and Networking Conference (WCNC2018), 15-18 April 2018, Barcelona, Spain
- [Panel Talk] “Wireless HP (High Performance): a New Target of Industrial Wireless for Control Systems”, IEEE GLOBECOM 2017, 4-8 December 2017, Singapore
- [Judge of Contest] ABB China University Innovation Contest 2018, Sep 25, 2018, Beijing, China
- [Panel Talk] Ericson Open Research Day, May 16, 2017, Stockholm, Sweden
- [Keynote] The 11th IEEE-EMBS International Summer School and Symposium on Medical Devices and Biosensors (MDBS' 2017), Shenzhen, China, on July 07 - July 11, 2017,
- [Keynote at Workshop] IEEE 85th Vehicular Technology Conference: VTC2017-Spring, 4–7 June 2017, Sydney, Australia
- [Panel Talk] IEEE Sensors Applications Symposium (SAS2017), Mar 13-15, Glassboro, NJ, USA
- [Invited Plenary Speech] The 21st International ITG Workshop on Smart Antennas (WSA2017), Mar 15-17, Berlin, Germany
- [Plenary Speech] “Towards Real Time Wireless Cyber Physical Systems”, 9th EAI International Wireless Internet Conference (WICON), Haikou, China, Dec 2016
- [Plenary Speech] “Unlock the Deployment of Cyber Physical Systems by Real-Time Wireless Communications”, the 2016 World Cybermatics Congress (Cybermatics 2016) Dec. 16-19, 2016, Chengdu, China
- [Plenary Speech] “Towards Real Time Wireless Cyber Physical Systems”, The 4th International Conference on Enterprise Systems (ES2016), Melbourne, Australia / 2-3 November, 2016
- [Plenary Speech] “Replace the Optical Fiber by wireless for real-time CPS? - Industrial perspective, challenges and directions”, The 42nd Annual Conference of IEEE Industrial Electronics Society (IECON2016), October 24-27, 2016, Firenze (Florence), Italy
- [Keynote] “Towards the Real-Time Cyber Physical Systems for Smarter Living and Production Facilities”, The 2016 International Conference on SmartX on 29-31 July 2016, in Dalian, China
- [Panel Talk] “Connectivity for future buildings towards the Internet of Things, Services and People: trends and challenges”, IEEE Industry Tech Summit, Jun 6-7, 2016, Santa Clara, USA
- [Plenary Speech] “Industrial Internet of Things, Services, and People for Innovative Cities Driven by the Industry4.0”, 2016 International Forum on Innovative Cities, July 16-17, Shenzhen, China
- [Tutorial] “Industrial Informatics for Future Buildings and Homes”, 14th IEEE International Conference on Industrial Informatics (INDIN2016), 18-21 July 2016, Futuroscope-Poitiers, France
- [Invited Tutorial] “Industrial perspectives of future buildings under the context of internet-of-Things and Industry4.0”, IEEE Smart City 2015 Conference, Dec 2015, Chengdu, China
- [Invited Speech] “How big are the data in the era of Industrial Internet of Things (IIoT) and Industry 4.0”, China-Northern Europe Conference on Big Data – Journal of Management Informatics special issue on Big

Data Methods and Applications, Aug 3-4, 2015, Stockholm, Sweden

[Plenary Speech] “Business-Technology Co-Design on Industrial Internet-of-Things”, IEEE Conference on Enterprise Systems (ICES2014), Aug 2014, Shanghai, China

[Invited Speech] “Research on the Industrial Internet-of-Things for Sustainability”, Low Carbon Earth Summit(LCES2013), Sep 2013, Xi’an, China

[Invited Lecture] “Research on the Industrial Internet-of-Things (I-IoT)”, EIT ICT Labs Summer School on Internet of Things 2014, July 2014, Stockholm, Sweden

CONFERENCE SERVICE – LEADERSHIP

[Industry Co-Chair] 19th IEEE International Conference on Factory Communication Systems (WFCS 2023), April 26 - 28, 2023, Pavia, Italy

[Organizer of Special Session] the 48th Annual Conference of the IEEE Industrial Electronics Society (IECON2022), October 18-21, 2022, Brussels, Belgium

[Workshop Organizer] Workshop on Healthcare 4.0, the 48th Annual Conference of the IEEE Industrial Electronics Society (IECON2022), October 18-21, 2022, Brussels, Belgium

[Workshop Organizer] Workshop on Industrial Wireless Technologies and Systems, the 48th Annual Conference of the IEEE Industrial Electronics Society (IECON2022), October 18-21, 2022, Brussels, Belgium

[Associate Editor] 2022 IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI), Sep. 27 - 30, 2022, Ioannina, Greece

[Industrial Forum Co-Chair, Track Chair] 2022 IEEE International Conference on Industrial Technology (ICIT2022), online and Shanghai, China, 22-25 Aug 2022

[Industrial Forum Co-Chair] The 5th IEEE International Conference on Industrial Cyber-Physical Systems (ICPS2022), 24 – 26 May 2022, online and Coventry, United Kingdom.

[Industry Co-Chair] 18th IEEE International Conference on Factory Communication Systems (WFCS 2022), April 27 - 29, 2022, online and Pavia, Italy

[Industrial Forum Co-Chair] The IEEE 30th International Symposium on Industrial Electronics (ISIE2021), held 20-23 June 2021, online and Kyoto, Japan.

[Tutorial Co-Chair] 19th IEEE International Conference on Industrial Informatics (INDIN2021), 21-23 July 2021, Palma de Mallorca, Spain

[Steering Committee] EAI ICMTel 2022 - 4th EAI International Conference on Multimedia Technology and Enhanced Learning, April 15-16, 2022, Leicester, Great Britain

[Steering Committee] EAI ICMTel 2021 -3rd EAI International Conference on Multimedia Technology and Enhanced Learning, April 8-9, 2021, Leicester, UK (Online)

[Workshop Organizer] Workshop on Extreme URLLC towards 6G Connectivity, The IEEE International Conference on Communications (ICC 2021), 14-23 June 2021, Virtual / Montreal, Canada

[Industrial Liaison Co-Chair] IEEE-EMBS International Conference on Biomedical and Health Informatics (BHI’21) Jointly Organized with the IEEE-EMBS International Conference on Wearable and Implantable Body Sensor Networks (BSN’21), Athens, Greece, from 21-24 September, 2021

[General Co-Chair] 17th IEEE International Conference on Factory Communication Systems (WFCS2021), 9 - 11 June 2021, Linz, Austria

[Workshop Organizer] Workshop on Information Freshness, Communications, Control, and Computing for Industrial IoT, IEEE Global Communications Conference (Globecom2020), 8–10 December 2020, Taipei, Taiwan

[Organizer of 2 Special Sessions] the 46th Annual Conference of the IEEE Industrial Electronics Society (IECON2020), Singapore, Oct 18-20, 2020

[Tutorial Co-Chair, Organizer of Special Session] 2020 IEEE 18th International Conference on Industrial Informatics (INDIN2020), Guangzhou, China, 11-13 July 2020

[Organizer of Invited Session] The 1st International Conference on Industrial Artificial Intelligence (IAI2019), July 23-25, 2019 Shenyang, Liaoning, China

[Organizer of Special Session] The 24th IEEE Conference on Emerging Technologies and Factory Automation

- (ETFA2019), Zaragoza, Spain, September 10th - 13th, 2019
- [Organizer of 4 Special Sessions] The 2nd IEEE International Conference on Industrial Cyber-Physical Systems (ICPS2019), Taipei, Taiwan, May 6-9, 2019
- [Industrial Forum Co-Chair, and Organizer of Special Session] The IEEE International Conference on Industrial Informatics (INDIN2019), Helsinki, Finland, July 23-25, 2019
- [Panel Co-Chair] The 2nd IEEE International Conference on Industrial Internet (ICII2019), Orlando, USA, Nov 11-12, 2019
- [Associate Editor] The IEEE Conference on Biomedical and Health Informatics (BHI) 2018, Las Vegas, Nevada, USA, 4-7 March 2018.
- [General Chair] The 5th IEEE International Conference on Enterprise Systems (ES2017), Beijing, China, Sep 22-24, 2017
- [General Chair] The International Academician Forum on Industry 4.0 and Made-in-China 2025, Yiwu, China, Sep 18-20, 2017
- [Industrial Liaison] 17th international Conference on Computer Analysis of Images and Patterns (CAIP2017), 22-24 Aug, 2017, Ystad, Sweden
- [General Chair] Karolinska Workshop on the Convergence of Sciences, Engineering, Medicine, and Management for Aging Health, May 22, 2017, Stockholm, Sweden
- [Organizer of Tutorial] the 14th IEEE International Conference on Industrial Informatics (INDIN2016), 18-21 July 2016, Futuroscope-Poitiers, France
- [Organizer of Special Session] 2016 25th IEEE International Symposium on Industrial Electronics (ISIE2016), Jun8-10, 2016, Santa Clara, USA
- [Organizer of Special Session] 2016 117th IEEE International Conference on Industrial Technology (ICIT2016) , Mar14-17, 2016, Taipei, Taiwan

CONFERENCE SERVICE – TPC MEMBER

- IEEE Global Communications Conference (GLOBECOM2019) workshop on Future wireless access for Industrial IoT (FutureIIoT), 9-13 December 2019, Waikoloa, HI, USA
- The 11th International Symposium on UbiSafe Computing (UbiSafe 2019), Atlanta, USA, July 14-17, 2019
- The 19th IEEE International Conference on Scalable Computing and Communications (ScalCom-2019), Leicester, UK, 19-23 August 2019.
- The 15th International Symposium on Pervasive Systems, Algorithms and Networks (I-SPAN 2018), Yichang, China, October 16-18, 2018
- The 16th IEEE International Conference on Smart City, (Smart City 2018), Exeter, UK, Jun 28-30, 2018
- The 2018 IEEE International Conference on Cyber, Physical and Social Computing (CPSCoM 2018), Halifax, Canada, July 30 – Aug 3, 2018
- The 6th International Conference on Enterprise Systems (ES2018), Limassol, Cyprus, Oct 01-02, 2018
- IEEE International Congress on Big Data, July 2-7, 2018, San Francisco, CA, USA
- The 3rd EAI International Conference on Smart Grid and Innovative Frontiers in Telecommunications, APRIL 23–25, 2018, AUCKLAND, NEW ZEALAND
- The 1st IEEE International Conference on Industrial Cyber-Physical Systems (ICPS 2018), Saint Petersburg, Russia, on May 15-18, 2018.
- The 3rd International Conference on Internet of Things, Big Data, and Security (IoTBDs2018), 19-21 March, 2018, Funchal, Madeira, Portugal
- The 3rd International Conference on Cybernetics (CYBCONF2017), Exeter, UK, 21-23Jun, 2017
- The 2nd International Conference on Enterprise Architecture and Information Systems (EAIIS 2017), July 9-13, 2017, Hamamatsu, Japan
- International Conference on Smart Grid Inspired Future Technologies (SmartGIFT2016), May 9–20, 2016, Liverpool, Great Britain

International Conference on Internet of Things and Big Data (IoTBD2016), Apr23-25, 2016, Rome, Italy

IEEE Smart City 2015 Conference, Dec19-21, 2015, Chengdu, China

The 13th IEEE International Conference on Ubiquitous Computing and Communications (IUCC2014), Dec 2014, Chengdu, China

SUPERVISION

Co-Supervised Postdoc researchers at universities:

Deyou Zhang, on “High accuracy positioning, security and machine learning for intelligent wireless communications”, Royal Institute of Technology (KTH), 2020.01-present.

Yifan Gu, on “Low latency and high reliability wireless communication for industrial applications”, University of Sydney, Australia, 2019.02-2021.06, currently Assistant Professor at Shenzhen University, China

Jing Yue (female), on “Distributed Fog Computing Based on Batched Sparse Codes for Industrial Control”, Royal Institute of Technology (KTH), Sweden, 2017.03-2019.02, currently Experience Researcher at Ericsson Research, Sweden

He Chen, on “Low latency and high reliability wireless communication for industrial applications”, University of Sydney, Australia, 2018.01-2019.05, currently Assistant Professor at the Chinese University of Hong Kong, China.

Co-Supervised PhD students at universities:

Abdul Jabbar, on “Agile intelligent beamforming antenna for industrial control”, University of Glasgow, UK, 2020.11-present

Yu Liu, on “Enable the landing of Internet of Things: a holistic approach”, Linköping University, Sweden, 2019.04-2021.06, currently Experience Researcher at Ericsson Research, Sweden

Xiaolin Jiang (female), on “Wireless Communication for Critical Control: Analysis and Experimental Validation”, Royal Institute of Technology (KTH), Sweden, 2015.09-2020.05, she spent 50% of time at ABB under my daily supervision, passed PhD defense on 2020-05-29, currently Experience Researcher at Ericsson Research, Sweden.

Emil Hakansson, on “Quantum communication for critical industrial applications”, Stockholm University, Sweden, 2019.09-2020.03, my responsibility was handed over to another colleague then another company due to ABB’s divestment of Power Grids business.

Supervised Postdoc researchers during their visit at ABB²:

Ming Zhan, on “Channel coding in high reliability and low latency wireless communication for industrial applications”, University of Electronics Science and Technology of China, China, and Royal Institute of Technology (KTH), Sweden, 2016.09-2017.08, currently Professor at the Southwest University, Chongqing, China.

Supervised PhD students during their visit at ABB³:

Honghao Lyu, on “Robot control over wireless networks and edge computing”, Zhejiang University, China, and Royal Institute of Technology (KTH), Sweden, 2021.12-2022.10

Fei Pan (female), on “Physical layer security in wireless communication for industrial applications”, University of Electronics Science and Technology of China, China, and Royal Institute of Technology (KTH), Sweden, 2017.11-2018.10, currently Associate Professor at the Sichuan Agricultural University, Ya’an, China.

Deep Shrestha, on “Precise clock synchronization in wireless communication for industrial applications”, Centre Tecnològic de Telecomunicacions de Catalunya, Spain, 2017.01-2017.05, currently Research Scientist at Ericsson, Barcelona, Spain.

Michele Luvisotto, on “Customized physical layer in high performance wireless communication for industrial applications”, 2016-2017, University of Padova, Italy, 2016.03-2016.09, currently Research Group Manager at Hitachi-ABB Power Grids Research, Vasteras, Sweden.

Jing Yue (female), on “Network coding in high performance wireless communication for industrial applications”,

² Zhibo Pang takes the full responsibility of supervising their day-to-day work and ABB solely owns their results

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University of Sydney, Australia, 2016.12-2017.02, then she continued her career as Postdoc research at Royal Institute of Technology (KTH), Sweden.

Supervised master students during their thesis projects at ABB⁴:

Jing Yan (female), University of Trento, Italy, and Aalto University, Finland, ““Experimental Study and Performance Analysis of Cloud Computing Architectures for Industrial Control Systems”, 2022.02-2022.07, currently with Intel, Finland

Anna Bengtsson (female), Uppsala University, Sweden, “Latency Aware and Event-Based Wireless Control for Cloud-Fog Automation”, 2022.02-2022.06

Sofie Nilsson (female), Uppsala University, Sweden, “Latency Aware and Event-Based Wireless Control for Cloud-Fog Automation”, 2022.02-2022.06

Johannes Deivard, Mälardalen University, Sweden, “Diagnostics framework for time-critical control systems in cloud-fog automation”, 2022.01-2022.06

Valentin Johansson, Mälardalen University, Sweden, “Diagnostics framework for time-critical control systems in cloud-fog automation”, 2022.01-2022.06

Emil Lindahl, Uppsala University, Sweden, “Towards latency-aware control using 5G and Edge-based control architectures”, 2021.08-2021.12

Maxx Wallberg, Uppsala University, Sweden, “Towards latency-aware control using 5G and Edge-based control architectures”, 2021.08-2021.12

Koushik Bhimavarapu, Blekinge Institute of Technology, Sweden, “Performance Analysis and Improvement of 5G based Mission Critical Motion Control Applications” 2021.04-2021.10, currently with ABB Corporate Research, Sweden

Fangbo Shi, Royal Institute of Technology (KTH), Sweden, “Emerging wireless communication and edge computing for autonomous mobile robots”, 2021.04-2021.10

Nusrat Hossain (female), Uppsala University, Sweden, 2021.03-2021.08, currently with Ericsson, Sweden

Florian Haslhofer, Johannes Kepler Universität Linz, Austria, “Safety protocols over real-time wireless network for factory automation and mobile robotics”, 2019.08-2019.09

Marco Rossanese, University of Padova, Italy, “Real-time wireless for motion control of manipulator and mobile platform in industrial robotics”, 2019.03-2019.11

Dapeng Lan, Royal Institute of Technology (KTH), Sweden, “Experimental Study of Thread Mesh Network for Wireless Building Automation Systems”, 2016.01-2016.08, currently with Oslo University, Norway

Eva-Azoidou (female), Royal Institute of Technology (KTH), Sweden, “Modeling and Validation of Power Consumption for Battery-Operated Sensor Devices in Wireless Networks Based on the Thread Protocol”, 2016.04-2016.10, currently with Atlas Copco, Sweden

Yu Liu, University of Trento, Italy, “Migration from Non-IP to Native-IP Building Automation Networks: Perspective of KNX and Thread”, 2016.04-2016.10, currently with Ericsson Research, Sweden

Hui Zhu (female), Royal Institute of Technology (KTH), Sweden, “Evaluation and Research on Gaps in IoTSP Protocols for Building Automation and Smart Grid”, 2015.08-2016.02

Binbin Xie, Royal Institute of Technology (KTH), Sweden, “Evaluation and Research on Gaps in IoTSP Protocols for Building Automation and Smart Grid”, 2015.07-2016.02, currently with JD.COM, China

Jakob Branger, Linköping University, Sweden, “Standardization Perspectives of Communication Infrastructure for Future Buildings under the Context of IoT and Industrial4.0”, 2015.04-2015.10

Asad Raja, Royal Institute of Technology (KTH), Sweden, “High Accuracy Location-Based Services (HiLBS) for Smart and Sustainable Buildings”, 2015.01-2015.07

Xiaoyu Min, Aalto University, Denmark, “Low Power Wireless IP Connectivity for Smart Buildings and IoT”, 2015.01-2015.07

Shaoling Zhu, Royal Institute of Technology (KTH), Sweden, “Low Power Wireless IP Connectivity for Smart Buildings and IoT”, 2015.01-2015.07

⁴ Zhibo Pang takes the full responsibility of supervising their day-to-day work and ABB solely owns their results

Jia Wang (female), Royal Institute of Technology (KTH), Sweden, “RESTfull Web Service Based Engineering Tools for Wireless Home Automation Systems”, 2014.10-2015.04

Yuxin Cheng, Sweden, Royal Institute of Technology (KTH), “Hybrid Communication Architecture for IP-based Wireless Home Automation Systems with Both Cloud-Based Mode and Stand-Alone Mode”, 2014.06-2014.12

Bruno Silva, University of Pretoria, South Africa, “IR-UWB Based High Accuracy Localization Technology for Industrial Applications”, 2013.09-2014.02

Co-Supervised master students during their thesis project at KTH⁵:

Xiaoying Sun, Royal Institute of Technology (KTH), Sweden, Development of a charging management systems for heavy-duty trucks, 2022.1-2022.6

Gong Li, Royal Institute of Technology (KTH), Sweden, Universal sensor interface chip solution for wireless sensors, 2012

Kang Kai, Royal Institute of Technology (KTH), Sweden, Multi-Source Energy Harvesting for Wireless Sensor Network, 2012

Teng Wang, Royal Institute of Technology (KTH), Sweden, Water Quality Monitoring System based on WSN, 2012

Shuxiang Xu, Royal Institute of Technology (KTH), Sweden, Protocol Implementation of WSN, 2012

Jiahua Zhu, Royal Institute of Technology (KTH), Sweden, The Investigation for Water Quality Sensors, 2012

Yin Hua, Royal Institute of Technology (KTH), Sweden, NFC enabled wireless sensor system, 2012

Junzhe Tian, Royal Institute of Technology (KTH), Sweden, Prototype of user-centric ubiquitous intelligence based on open platform, 2012

Bowei Dai, Royal Institute of Technology (KTH), Sweden, Modeling and Planning of Service-Oriented Wireless Sensor Network, 2012

Chengxin Zhao, Royal Institute of Technology (KTH), Sweden, On-site Data Processing Algorithms and Implementation for Wireless Sensor Network, 2011

Mohammad Tareq-Ul-Islam, Royal Institute of Technology (KTH), Sweden, Universal Sensor Interface Circuit for Wireless Sensor Network, 2011

Xiatao Wang, Royal Institute of Technology (KTH), Sweden, Web-based RFID Tracking System Design and Implementation, 2011

TEACHING

KTH, master course, [EQ2461](#) Seminars in Information and Network Engineering, regular guest lecturer

KTH, PhD course, [FEO3290](#) Selected Topics on Emerging Information Technologies for Industrial Digitalization, develop and deliver half of the lectures

ZJU, postgraduate course, Intelligent Perception and Human Robot Interaction, regular guest lecturer

MEMBERSHIP

Senior Member, IEEE, 2015-present

REFERENCES

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⁵ Zhibo Pang supports the main supervisor and supervise their day-to-day work for the project in which he was the main PhD researcher

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Dr. Richard Candell, Lead of Industrial Wireless Systems, National Institute of Standards and Technology (NIST), 100 Bureau Drive, MS 8230, Gaithersburg, MD 20899, USA, +1-301-975-4287, rick.candell@nist.gov

Dr. Dacfe Dzong, Corporate Research Fellow (retired), ABB Corporate Research Switzerland, dacfe.dzung@gmail.com

Prof. Preben E. Mogensen, Bell Labs Fellow, Nokia, Fredrik Bajers Vej 7, A4-204, 9220 Aalborg, Denmark, +45-9940 8658, preben.mogensen@nokia.com

Prof. Axel Jantsch, Professor in Systems on Chip, Institute of Computer Technology, TU Wien, Gußhausstraße 27-29, 1040 Wien, Austria, +43 1 58801 38415, axel.jantsch@tuwien.ac.at

Publication of Zhibo Pang

GRANTED PATENTS⁶

[P024] **[Granted]** Zhibo Pang, Xiaolin Jiang, Michele Luvisotto, Roger Jansson, Carlo Fischione, “Scheduling-transparent time-shifted duplicated network to improve availability”, International Patent PCT published as US 11,337,236 B2, EP19155673.7, Assignee: Hitachi Energy Switzerland AG, Filed 2019-02-06, Granted in US: 2022-05-17. (Core innovation: time-shifted scheduling for duplicated network).

[P023] **[Granted]** Zhibo Pang, Michele Luvisotto, Roger Jansson, “Method to efficiently handle low latency cyclic data inside a wireless communication node between communication interface and applications within node while maintaining data consistency and handling communication errors efficiently”, International Patent PCT published as US 11,233,624 B2, EP19155669.5, Assignee: ABB Technology Ltd, Filed 2019-02-06, Granted in US: 2022-01-25. (Core innovation: hardware MAC and software MAC interfaced by shared memory with batch processing).

[P022] **[Granted]** Zhibo Pang, Nan Chen, Mikael Davidsson, Michele Luvisotto, “Valve unit with wireless interface for high-voltage power electronics system”, International Patent PCT published as US 11,289,792 B2, EP 19162288.5, Assignee: ABB Technology Ltd, Filed: 2019-03-12, Granted: 2022-03-29. (Core innovation: installation of wireless antenna in HVDC valve and installation of wireless RF cell separated from HVDC hall).

[P021] **[Granted]** Zhibo Pang, Michele Luvisotto, “Automatic gain control in a wireless communication network for power grid control”, International Patent PCT published as WO2019158183, CN111713015 EP3753104 US20210006219 EP2018705872, Assignee: ABB Technology Ltd, Filed: 2018-02-13, Published: 2019-10-02. Granted: 2021-06-01, (Core innovation: to enable the WirelessHP-based control of power grids automation systems, ultra-short packet is applied but this makes it more difficult to estimate the received signal strength and control the gain of analog amplifier by the receiver. We signal strength of each packet and accumulate across multiple time slots based on the available scheduling information to improve the accuracy of estimation).

[P020] **[Granted]** Zhibo Pang, Dacfe Dzong, Mikael Davidsson, “Communications network for communication between a control unit and a power electronics element”, International Patent PCT published as WO-2018210413, US 11,075,720 B2, EP3625914, CN110915155, Assignee: ABB Technology Ltd, Filed: 2017-05-16, Published: 2019-01-02. (Core innovation: to enable the WirelessHP-based control of high voltage power electronics systems like the HVDC power converter, acknowledgement from each switching device is transmitted to the controller concurrently by CDMA and forwarded more efficiently through multi-hop network to reduce the round-trip latency and occupied channel resources)

[P019] **[Granted]** Zhibo Pang, Dacfe Dzong, “Communications system for transmission of control signals to a power electronics module”, International Patent PCT published as WO-2018215073, EP3631941, Assignee: ABB Technology Ltd, Filed 2017-05-26, Published: 2019-01-09. (Core innovation: to enable the WirelessHP-based control of high voltage power electronics systems like the HVDC power converter, beamforming is applied to tune the pattern of the radio signals between transmitter and receiver which can improve reliability and reduce the risk caused by intentional and nonintentional interferences).

[P018] **[Granted]** Zhibo Pang, Dacfe Dzong, Mikael Davidsson, “Communications network for communication between a power electronics element and a control unit”, International Patent PCT published as US 11,177,857 B2, WO-2018113960, CN-110168832, EP-3560058,, Assignee: ABB Technology Ltd, Filed 2016-12-21, Published: 2018-06-28. (Core innovation: using short latency, high reliability and multi-hop WirelessHP network to transmit control commands for the switching signals of power electronics devices like IGBT in high voltage power electronics systems like HVDC converter).

[P017] **[Granted]** Zhibo Pang, Gargi Bag, Morgan Johansson, “Installation of building automation devices”, International Patent PCT published as WO 2017092802 A1, EP-3384633-B1, US11431521 (B2), Assignee: ABB Technology Ltd, Filed 2015-12-02, Published: 2017-06-08. (Core innovation: an added functionality in a mobile device that uses location information to help install devices in correct place, pair physically close by devices as corresponding nodes, and assign common security parameter for devices located close by for group communication).

[P016] **[Granted]** Zhibo Pang, Gargi Bag, Morgan Johansson, “Managing communication between gateway and

⁶ Only one item is listed here if the patent application is filed or granted in multiple countries using different numbers. Some of the items are hidden as they are still in the confidential stage of the patent lifecycle.

building automation device by installing protocol software in gateway”, International Patent PCT published as WO 2017084719 A1, EP-3378192-A1, US 10,892,908 B2. Assignee: ABB Technology Ltd, Filed 2015-11-20, Published: 2017-05-26. (Core innovation: download and install the protocol software from server to the gateway so that the gateway can support multiple IWSN protocols with lower cost and become future proof).

[P015] **[Granted]** Zhibo Pang, Gargi Bag, Morgan Johansson, “Managing communication between gateway and building automation device”, International Patent PCT published as WO 2017084718 A1, EP-3378191-B1, US11424948B2 Assignee: ABB Technology Ltd, Filed 2015-11-20, Published: 2017-05-26. (Core innovation: reconfigure the IWSN device by the gateway through a default PHY/MAC mode so that the device can run another PHY/MAC protocol with lower cost and become future proof in building automation systems).

[P014] **[Granted]** Zhibo Pang, Gargi Bag, Morgan Johansson, “Health report sending from a wireless communication network”, International Patent PCT WO-2017092825-A1, DE-112015007164-T5, US 10,708,800 B2, Assignee: ABB Technology Ltd, Filed 2015-12-04, Published: 2017-06-08. (Core innovation: sending the health status of IWSN devices for on-site diagnosis through a second protocol e.g. BLE without interrupting the communication of the main protocol e.g. Thread during operation in building automation systems)

[P015] **[Granted]** Mikael Gidlund, Johan Åkerberg, Zhibo Pang, Kan Yu, “Determination of communication routes in a wireless communication network”, International Patent PCT published as WO2014005754, US9338058, US2015156070, EP2683199, CN104685931B, CN104685931, PL2683199T, IN2015CN17A, Assignee: ABB Research Ltd, Filed 2012-07-05, (Core innovation: using directional flooding to replace conventional routing in IWSN for better reliability and latency)

[P012] **[Granted]** Jun Chen, Zhijie Huang, Zhibo Pang, “A Method to display multiple images in the same screen”, Chinese Patent ZL200610098901.4, Assignee: Guoxin Science & Technology Co, Filed 2006-07-14, Granted 2010-05-12. (Core innovation: sophisticated arrangement of memory space to store the picture-in-picture image data, which largely reduces the required SDRAM space of digital television.)

[P011] **[Granted]** Yuqing Zhong, Zhibo Pang, “Method for showing animation effect”, Chinese Patent ZL200610098909.0, Assignee: Guoxin Science & Technology Co, Filed 2006-07-14, Granted 2009-09-16. (Core innovation: periodically change the contents of color table to dynamically map the coded/compressed graphical user interface data to actual displayed image, which enables more flexible animation effects for UI design of digital television with minimized cost.)

[P010] **[Granted]** Zhibo Pang, Ding Zhang, Xiaowei Huang, “Video decoding method”, Chinese Patent ZL200610098904.8, Assignee: Guoxin Science & Technology Co, Filed 2006-07-14, Granted 2008-10-01. (Core innovation: decode the B frame of MPEG video stream twice instead of once, which enables radical reduction of required memory space to 2~3 decoded image frames.)

[P009] **[Granted]** Zhibo Pang, Ding Zhang, Xiaowei Huang, “Method to generate the preview images”, Chinese Patent ZL200610098903.3, Assignee: Guoxin Science & Technology Co, Filed 2006-07-14, Granted 2008-08-27. (Core innovation: apply frequency domain filtering to the DCT parameters during decoding, then apply 2D smooth filtering during playback, which largely reduces complexity to generate down sampled preview image of MPEG video stream.)

[P008] **[Granted]** Jian Liang, Zhibo Pang, Mengyao Zhu, “Method for video and audio synchronization”, Chinese Patent ZL200610098906.7, Assignee: Guoxin Science & Technology Co, Filed 2006-07-14, Granted 2008-11-26. (Core innovation: extra timestamps from the multiplexed MPEG audio and video streams and save them together with the demultiplexed streams respectively, then synchronize the audio and video streams based on these timestamps during decoding and playback.)

[P007] **[Granted]** Zhibo Pang, Bingbo Li, Xiaowei Huang, “Method to improve the SDRAM bus efficiency in video decoder”, Chinese Patent ZL200610098907.1, Assignee: Guoxin Science & Technology Co, Filed 2006-07-14, Granted 2008-12-17. (Core innovation: ping-pong operation of reading and writing SDRAM for decoding MPEG video stream, which largely increases the bandwidth efficiency of the SDRAM bus.)

[P006] **[Granted]** Zhibo Pang, Bingbo Li, Mingchao Ma, “Storage management method for video decoding”, Chinese Patent ZL200610098905.2, Assignee: Guoxin Science & Technology Co, Filed 2006-07-14, Granted 2008-10-22. (Core innovation: sophisticated arrangement of SDRAM memory space for decoding and playing back MPEG video stream which only requires 2~2.5 frames stored in the memory. This method radically reduces the cost of SDRAM from 32Mb to 16Mb.)

[P005] **[Granted]** Xiaowei Huang, Zhibo Pang, Ding Zhang, “Method to record the booting images”, Chinese Patent ZL200610098902.9, Assignee: Guoxin Science & Technology Co, Filed 2006-07-14, Granted 2008-10-22. (Core innovation: using hardware accelerator to capture an highly compressed inner frame from the MPEG2 video stream as booting image of the TV set-top-box, then play it back during the boot of the set-top-box. This method provides more user friendly design of software with minimized cost.)

- [P004] **[Granted]** Zhijie Huang, Zhibo Pang, Ming Zhang, “Automatic channel searching method in digital Tv-set”, Chinese Patent ZL200410054279.8, Assignee: Guoxin Science & Technology Co, Filed 2004-09-03, Granted 2007-10-10. (Core innovation: use narrow band filter to scan the spectrum of receiver QAM/PSK signals, then recognize a valid TV channel is there if the spectrum meets a certain pattern, then start fast timing and carrier recovery operation until the scan of the whole band is finished. This method enables fast and blind scan/discovery of valid digital TV signals in a wide spectrum.)
- [P003] **[Granted]** Zhibo Pang, Zhijie Huang, Ming Zhang, “Method to improve timing recovery lock detecting”, Chinese Patent ZL200410054276.4, Assignee: Guoxin Science & Technology Co, Filed 2004-09-03, Granted 2008-04-02. (Core innovation: use a FIFO structure to replace the traditional IIR filter to implement the low pass filter of the timing recovery loop of QAM/PSK signals. This method can achieve both smoothness and responsiveness of the timing recovery loop, which is important for fast signal/channel search.)
- [P002] **[Granted]**, Zhijie Huang, Zhibo Pang, Ming Zhang, “A method of timing recovery”, Chinese Patent ZL200410054277.9, Assignee: Guoxin Science & Technology Co, Filed 2004-09-03, Granted 2008-02-06. (Core innovation: select useful half-symbol and full-symbol samples from the I and Q components by applying a selectin window according to their amplitude and phase, then extract the time recovery error from the selected I/Q samples. This method can enable fast timing recovery of QAM/PSK signals with very large carrier frequency error which is important for fast signal/channel search.)
- [P001] **[Granted]**, Zhibo Pang, Zhijie Huang, Ming Zhang, “A lock detecting method in timing recovery for QAM and PSK signals”, Chinese Patent ZL200410054278.3, Assignee: Guoxin Science & Technology Co, Filed 2004-09-03, Granted 2008-04-02. (Core innovation: calculate the average radius of the half-symbol samples and full-symbol samples of the I and Q components of QAM/PSK signals, the timing recovery loop is seen as locked when the difference between these two average values is big enough. This method can largely increase the reliability and timeliness of the detection which is important for fast signal/channel search.)

DISSERTATIONS

- [D2] Zhibo Pang, “Technologies and Architectures of the Internet-of-Things (IoT) for Health and Well-being”, PhD Thesis, KTH Royal Institute of Technology, Stockholm, Sweden, 2013
- [D1] Zhibo Pang, “Business Model Design for Personal Mobile Healthcare Service: the Methodology and Case Study”, MBA Thesis, University of Turku, Turku, Finland, June 2012.

AUTHORED OR EDITED BOOKS

- [B02] Hans-Peter Bernhard, and Zhibo Pang, Proceedings of the 17th IEEE International Workshop on Factory Communication Systems (WFCS 2021) - Communication in Automation, IEEE, 2021
- [B01] Zhibo Pang, Lefei Li, and Gang Li, Proceedings of the 5th International Conference on Enterprise Systems (ES2017) - Industrial Digitalization by Enterprise Systems, IEEE, 2017

PEER-REVIEWED JOURNAL PUBLICATIONS

- [J102] H. Lv, Z. Pang*, K. Bhimavarapu and G. Yang, "Impacts of Wireless on Robot Control: The Network Hardware-in-the-Loop Simulation Framework and Real-Life Comparisons," in IEEE Transactions on Industrial Informatics, doi: 10.1109/TII.2022.3227639. 2022
- [J101] Zhang, Y., Liang, W*, Zhang, S. Yuan, X., Xia, X., Tan J., Pang, Z., High-precision Calibration of Camera and IMU on Manipulator for Bio-inspired Robotic System. J Bionic Eng 19, 299–313 (2022). <https://doi.org/10.1007/s42235-022-00163-7>
- [J100] D. Zhang S. Shen, C. She*, M. Xiao*, Z. Pang, Y. Li, L. Wang, "Training Beam Sequence Design for mmWave Tracking Systems With and Without Environmental Knowledge," in IEEE Transactions on Wireless Communications, 2022, doi: 10.1109/TWC.2022.3187167.
- [J099] K. Bhimavarapu, Z. Pang*, O. Dobrijevic and P. Wiatr, "Unobtrusive, Accurate, and Live Measurements of Network Latency and Reliability for Time-Critical Internet of Things," in IEEE Internet of Things Magazine, vol. 5, no. 3, pp. 38-43, September 2022, doi: 10.1109/IOTM.001.2200068.
- [J098] J. Jin, K. Yu, N. Zhang and Z. Pang, "Guest Editorial Real-time Edge Computing over New Generation Automation Networks for Industrial Cyber-Physical Systems," in IEEE Transactions on Industrial Informatics, 2022, doi: 10.1109/TII.2022.3189436.
- [J097] W. Lei, Z. Pang, H. Wen*, W. Hou and W. Han, "FDI Attack Detection at the Edge of Smart Grids based on Classification of Predicted Residuals," in IEEE Transactions on Industrial Informatics, doi: 10.1109/TII.2022.3174159.

- [J096] E. Sisinni, T. Sauter, Z. Pang and H. -P. Bernhard, "Guest Editorial: Advanced Industrial Communication Systems - A sneak peak to the ecosystem of next generation industrial communications," in *IEEE Transactions on Industrial Informatics*, doi: 10.1109/TII.2022.3167381.
- [J095] M. Zhan, Z. Pang*, D. Dzung, K. Yu and M. Xiao, "Short-Packet Interleaver against Impulse Interference in Practical Industrial Environments," in *IEEE Transactions on Wireless Communications*, 2022, doi: 10.1109/TWC.2022.3183175.
- [J094] Shiyong Ni, Xiwen Bai, Yuchen Liang, Zhibo Pang & Lefei Li* (2022) Blockchain-based traceability system for supply chain: potentials, gaps, applicability and adoption game, *Enterprise Information Systems*, DOI: 10.1080/17517575.2022.2086021
- [J093] Zhang, L.; Gu, Y.*; Wang, R.; Yu, K.; Pang, Z.; Li, Y.; Vucetic, B. "Enabling Real-Time Quality-of-Service and Fine-Grained Aggregation for Wireless TSN". *Sensors* 2022, 22, 3901. <https://doi.org/10.3390/s22103901>
- [J092] M. Zhan, Z. Pang*, K. Yu*, J. Xu, F. Wu and M. Xiao, "Noise Error Pattern Generation Based on Successive Addition-Subtraction for GRAND-MO," in *IEEE Communications Letters*, doi: 10.1109/LCOMM.2022.3148302.
- [J091] H. Lv, D. Kong, G. Pang, B. Wang, Z. Yu, Z. Pang, G. Yang*, "GuLiM: A Hybrid Motion Mapping Technique for Teleoperation of Medical Assistive Robot in Combating the COVID-19 Pandemic," in *IEEE Transactions on Medical Robotics and Bionics*, doi: 10.1109/TMRB.2022.3146621. 2022
- [J090] Liu, Y.; Mousavi, S.; Pang, Z.; Ni, Z.; Karlsson, M.; Gong, S. "Plant Factory: A New Playground of Industrial Communication and Computing" in *Sensors* 2022, 22, 147. <https://doi.org/10.3390/s22010147>
- [J089] H. Wang, M. Xiao*, and Z. Pang, "Satellite Based Computing Networks with Federated Learning," in *IEEE Wireless Communications Magazine*, 2021
- [J088] Q. Wang, R. Candell, W. Liang* and Z. Pang, "System Error Calibration in Large Datasets of Wireless Channel Sounding for Industrial Applications," in *IEEE Journal of Emerging and Selected Topics in Industrial Electronics*, vol. 3, no. 1, pp. 113-123, Jan. 2022, doi: 10.1109/JESTIE.2021.3122839..
- [J087] F. Xie, Z. Pang, H. Wen*, W. Lei and X. Xu, "Weighted Voting in Physical Layer Authentication for Industrial Wireless Edge Networks," in *IEEE Transactions on Industrial Informatics*, vol. 18, no. 4, pp. 2796-2806, April 2022, doi: 10.1109/TII.2021.3103780..
- [J086] Gaoyang Pang, Geng Yang*, Zhibo Pang*, "Review of Robot Skin: A Potential Enabler for Safe Collaboration, Immersive Teleoperation, and Affective Interaction of Future Collaborative Robots" in *IEEE Transactions on Medical Robotics and Bionics*, 2021, early access, doi: 10.1109/TMRB.2021.3097252..
- [J085] O. Seijo, I. Val, M. Luvisotto and Z. Pang, "Clock Synchronization for Wireless Time-Sensitive Networking: A March From Microsecond to Nanosecond," in *IEEE Industrial Electronics Magazine*, doi: 10.1109/MIE.2021.3078071.
- [J084] Yinlong Zhang, Wei Liang*, Mingze Yuan, Hongsheng He, Jindong Tan, Zhibo Pang, "Monocular Visual-Inertial and Robotic-Arm Calibration in a Unifying Framework", *IEEE/CAA Journal of Automatica Sinica*, 2021, accepted
- [J083] Ming Zhan, Zhibo Pang*, Kan Yu, Hong Wen, "Reverse Calculation-Based Low Memory Turbo Decoder for Power Constrained Applications," in *IEEE Transactions on Circuits and Systems I: Regular Papers*, 2021, early access, doi: 10.1109/TCSI.2021.3068623.
- [J082] Z. V. Gbouna, G. Pang, G. Yang*, Z. Hou, H. Lv, Z. Yu, and Z. Pang, "User-Interactive Robot Skin with Large-Area Scalability for Safer and Natural Human-Robot Collaboration in Future Telehealthcare," in *IEEE Journal of Biomedical and Health Informatics*, vol. 25, no. 12, pp. 4276-4288, Dec. 2021, doi: 10.1109/JBHI.2021.3082563. [Cover Paper]
- [J081] Tao Zhang*, Biyun Ding, Xin Zhao, Ganjun Liu, Zhibo Pang*, "LearningADD: Machine Learning based Acoustic Defect Detection in Factory Automation", *Journal of Manufacturing Systems*, 2021, accepted.
- [J080] Xiaolin Jiang, Michele Luvisotto, Zhibo Pang* and Carlo Fischione, "Reliable Minimum Cycle Time of 5G NR Based on Data-Driven Channel Characterization," in *IEEE Transactions on Industrial Informatics*, 2021, doi: 10.1109/TII.2021.3052922
- [J079] Yu Liu*, Dapeng Lan, Zhibo Pang, Magnus Karlsson and Shaofang Gong, "Performance evaluation of containerization in edge-cloud computing stacks for industrial applications: a client perspective," in *IEEE Open Journal of the Industrial Electronics Society*, 2021, doi: 10.1109/OJIES.2021.3055901.
- [J078] Kang B. Lee, Richard Candell, Hans-Peter Bernhard, Dave Cavalcanti, Zhibo Pang, Inaki Val, "Reliable,

- High-Performance Wireless Systems for Factory Automation”, NIST Interagency/Internal Report (NISTIR), No. 8317, Sep 18, 2020
- [J077] Yu Liu*, Zhibo Pang*, Magnus Karlsson*, Shaofang Gong*, “Anomaly detection based on machine learning in IoT-based vertical plant wall for indoor climate control”, *Building and Environment*, Vol 183, 2020, doi: 10.1016/j.buildenv.2020.107212.
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