

International Conference on Embedded Wireless Systems and Networks (EWSN) 2020

Lyon, France

17-19 February 2020

Proceedings

Edited by

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Message from the General Chairs

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We are pleased to welcome you to EWSN 2020, the International Conference on Embedded Wireless Systems and Networks, held in Lyon, France, from February 17-19, 2020. Originally established as the European Conference on Wireless Sensor Networks in 2004, EWSN has been the major European outlet for sensor networks research and a yearly gathering point for the research community, filling the gap between networking and system challenges in the context of connected objects. After its first instance outside of Europe in 2019, EWSN returns to Europe in the beautiful city of Lyon. Starting from sensor networks, research has expanded over the years to include related fields such as Internet of Things, where the focus is on providing Internet connectivity to embedded systems, or Cyber-Physical Systems where the focus is on the inclusion of networked control aspects. All of the conference's topics continue to share a focus on wirelessly networked embedded systems.

The keystone of the EWSN technical program will be a set of peer reviewed research papers. The fourteen selected papers will be presented in five sessions spanning two days of the conference. The session topics---low-power wide-area networks, mobility, dependability, knowing and exploiting hardware, and pushing radios---cover both current trends and future directions under the umbrella topic of embedded wireless sensor networks and Internet of Things. The fourteen papers were selected from 45 total submissions spanning Africa, Asia, Europe, as well as North and South America. All submissions received three to five reviews from Technical Program Committee (TPC) members during a single review phase. A rebuttal phase allowed authors to see and (optionally) respond to the reviews before the final decision was made. While all papers were discussed online using the conference management system, eight papers were additionally discussed during a "virtual TPC meeting" held via conference call. The TPC chairs would like to thank all the TPC members whose detailed reviews, active discussion and attentive shepherding led to the exciting 2020 technical program.

These research sessions will be complemented by a variety of other sessions and events, including two keynote presentations by internationally renowned researchers. The conference will open with a keynote presentation from Julie McCann of Imperial College, London entitled Reflections for a New Decade of Sensor-based Systems. On the conference's second day, Christian Bettstetter from University of Klagenfurt will

give a keynote address on the topic of Multi-drone systems: Embedded wireless sensor networks in the air.

Over the past four years, EWSN has hosted a dependability competition. In lieu of a formal competition this year, we will host a session in which we reflect on the role of experimentation and testbeds in research on embedded wireless sensor networks with a slate of four short invited talks and a panel discussion on the future of experimentation and testbeds.

This program will also include a session with posters and formal demonstrations. We received 2-page demo and poster abstracts that proposed valuable and consistent propositions. The poster/demo TPC provided 60 reviews that helped select 16 contributions: 9 demos and 7 posters will be presented. New this year, we will organize a more structured approach to the poster and demonstration session to encourage more direct engagement between the presenters and the visitors. The chairs would like to recognize the efforts of the organizers and program committee members for the demonstration and poster events for the extra effort they put in to ensure the success of EWSN 2020.

This year, EWSN starts with four workshops on wake-up radio technologies, reliable and robust and secure sensing systems, on-body sensor networks and massive LoRa deployments. During this first day, the program will also include two tutorials: one about VLC from complementary academic and industrial perspectives, and one about experimenting with wireless networking protocols using the FIT IoT Lab, the French wide testbed. Last year, the conference introduced the PhD Forum as a mechanism to encourage graduate student participation in the conference and to give participating students to directly engage with leaders in the community research community beyond their own research advisors. We continued this tradition this year, accepting three contributions to the PhD Forum.

The visibility and the growing attractiveness of EWSN comes from our wireless and system research communities and also to the support from ACM, especially ACM SigBed and ACM SigMobile, which allow us to publish all the accepted papers in ACM Digital Library. We also thank our sponsors: University of Lyon -a world-class academic site of excellence, located at the heart of the Auvergne-Rhône-Alpes region, in Lyon & Saint-Étienne-, INSA Lyon -the biggest French engineering school and a top ranked one-, the CITI research laboratory, Orange -a world-class telecommunication opera-

tors- and Inria -the French national research institute for the digital sciences, a world-class research and technological institute-.

EWSN 2020 is the result of enormous efforts on the part of many. Ramona Marfievici and Fabrice Theoleyre recruited a diverse and energetic set of workshops and tutorials and shepherded them all to the finish line. Nathalie Mitton, Carlo Alberto Boano, and Markus Schuss spearheaded the special panel on testbeds and experimentation. Anna Forster and Antoine Gallais developed an innovative and engaging approach to the poster and demo session that is sure to be quite memorable. Pedro Jose Marron and Panagiota Katsikouli took on the extremely important task of organizing the PhD Forum. The publicity chairs, Fred Jiang, Jialiang Lu, Andreas Reinhardt, and Aline Viana kept the media machine running, while the web chair Manoel Dahan responded gra-

ciously and promptly to copious demands for updates and changes. We are also grateful for the local organizers Razvan Stanica and Laetitia Lecot-Gauthe and the registration chair Sophie Azzaro. Finally, there are insufficient words to express our deepest gratitude to Oana Iova, while officially a local organization chair, should be deputized as a co-general chair; without her tireless prompting, patience, and attention to detail, the conference would not be what it is.

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Hossein Ajorloo, *University College Cork (Ireland)*

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Keynote Address

Reflections for a New Decade of Sensor-based Systems

Julie A. McCann
Imperial College London, UK



ABSTRACT

I began researching Sensor Nets in 2000 attracted by the whole Smart Dust thing. Since then I've seen the subject morph, grow and gain more impact on the world around us. In this keynote I will talk about my path through Sensor Networking arena and why I chose that path and what challenges I wanted to address and why. For the second part of my talk I hope to outline some of the future challenges that we need to start addressing now to avoid our subject becoming irrelevant or worse befalling the Distributed Systems Death!

PRESENTER

Julie A. McCann is a professor at Imperial College London where she leads the Adaptive Emergent Systems Engineering (AESE) group, and is the Director of the cross-Imperial College Smart Connected Futures centre of excellence. She also leads a sub-lab in A*Singapore as part of the HDB/NRF funded Smart Sensing Initiative in Singapore. Bringing together models of non-computing systems (e.g. the physical environment, social behaviours, economics etc.), McCann researches algorithms and protocols to optimize sensor-based computing systems' performance and reliability. She focuses on highly decentralised architectures, algorithms and cross-layered solutions applied to the Internet of Things, Wireless Sensor Networks and Cyber-physical systems. Since 2003 she has led and collaborated in a number of projects focused on the Internet of Water, a hypothetical notion that water pipes transcend from passive water deliverers to active water switching networks. For her earlier research in text retrieval, she was co-awarded Emerald Literati Network "Highly Commended" and has more recently won the best paper award in Globecom 2017 for her work on LPWA network support for IoT.

Keynote Address

Multi-drone systems: Embedded wireless sensor networks in the air

Christian Bettstetter
University of Klagenfurt, Austria



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ABSTRACT

Small drones are on everyone's lips: as toys, for aerial photography, and for the delivery of parcels. This keynote reviews drone applications and discusses some technological issues in more detail. Having done research in this field for more than ten years, Christian Bettstetter addresses the topics wireless connectivity and coordination of systems composed of multiple drones. He will present experimental results for Wi-Fi and cellular-connected drones and show demonstrations of drone swarms coordinating in both time and space. The talk closes with emerging topics and lessons learnt by the speaker and his team.

PRESENTER

Christian Bettstetter is professor and head of the Institute of Networked and Embedded Systems at the University of Klagenfurt, Austria, and founding scientific director of Lakeside Labs, a research and innovation company. He holds a doctoral degree (summa cum laude) in electrical and information engineering from TU Munich, Germany.

Bettstetter and his team work on wireless communications and self-organization in networked systems with application to telecommunications, IoT, and mobile robotics. Current projects investigate interference, synchronization, industrial sensor networks, and communications and path planning of drones. He is coordinator of an interdisciplinary research cluster on self-organizing systems and faculty member in the Karl Popper school on networked autonomous aerial vehicles.