

IEEE International Conference on Communications 21-25 May 2017 // Paris // France

5th IEEE ICC Workshop on Advances in Network Localization and Navigation (ANLN)

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**IEEE ICC 2017 Workshop on Advances in Network Localization and Navigation (ANLN)**

### ANLN Workshop at ICC 2017, Paris, France

Latest news:

- The ANLN Workshop will be held again at ICC 2017 in Paris. Workshop date will be Thursday, May 25, 2017. Further details will be announced soon.
- The first call for papers has been issued (Sept. 2016)

#### About the Workshop

Localization, tracking, and navigation – for indoor and outdoor environments – have been gaining relevance thanks to the steadily expanding range of enabling devices and technologies, as well as the necessity for seamless solutions for location-based services. Internet of Things, cyber-physical systems, and 5G communication networks will all benefit from localization, tracking, and navigation capabilities, leading to a vast range of new and heterogeneous application scenarios. A current trend in the design of solutions for localization, tracking, and navigation is to use standard, low-cost, and already deployed technologies. These technologies are highly heterogeneous as well, encompassing, to name a few examples, inertial measurement units, sonar, laser, IR, visible light communications, or RF signals. The RF signals typically include WiFi, UWB, RFID, Bluetooth, NFC, 3GPP/LTE, 802.11x, digital TV, or, in general, so-called available signals of opportunity. The availability of such technologies clearly entails that the latest challenge in localization, tracking, and navigation is not only to develop specialized sensors for these tasks but also to design and implement methods that exploit the cooperation of the already available systems. Data fusion, cross-layer optimization, and new application environments are therefore the key aspects for further advances of the field and present exciting challenges for wireless communications and signal processing practitioners and researchers.

The goal of the workshop is to solicit the development of new positioning algorithms based on short-range wireless communications as well as new location-aware procedures to enhance the efficiency of communication networks. It will bring together academic and industrial researchers to identify and discuss technical challenges and recent results related to localization, tracking, and navigation, as well as its connection to communication networks.

The workshop is organized in part by the EU COST Action IRACON, the Austrian Research Network DependableThings, and the EU-Marie Curie Project "PATH".

#### Venue, Date

The workshop will be co-located with IEEE ICC 2017, the International Conference on Communications (<http://www.ieee-icc.org/>), in Paris, France. It will be a one-day event, scheduled for May 25, 2017. (conference program: <http://icc2017.ieee-icc.org/program>)

#### Registration

Registration information for the workshop can be found through the ICC website: <http://icc2017.ieee-icc.org/registration>

#### Topics of interest

Topics of interest include, but are not limited to the following:

- Simultaneous localization, tracking, and mapping (SLAM)
- Data fusion schemes for heterogeneous technologies
- Cooperative localization and cloud SLAM
- Cooperative navigation
- Multi-agent control
- Fundamental limits
- Online Bayesian filtering
- Methods with robust performance
- Position-dependent parameter estimation techniques
- Learning algorithms for environmental mapping
- Localization via signals of opportunity
- Location-awareness for wireless networks
- Hybrid IMU and magnetic pedestrian navigation
- Ultra-wideband technology
- Passive and active RFID

- Spectrum/Energy efficient positioning systems
- Scheduling techniques for cooperative localization
- Wireless sensor radar
- Localization methods for the Internet of Things and 5G networks
- Security and privacy issues
- Mobility models for tracking
- Radio channel models
- Testbeds and experimentation

### Important dates

2 Dec. 2016: submission deadline  
 17 Feb. 2017: notification deadline  
 10 Mar. 2017: final manuscript  
 25 May 2017: workshop date

### Paper submissions

Paper submissions are handled by EDAS. Please follow this link: <https://edas.info/newPaper.php?c=22956>

Papers will be submitted for inclusion in IEEE Explore under "IEEE International Conference on Communications Workshops 2017 (ICC Workshops 2017)".

### Call for papers in PDF

[CFP for download. \(\\*.pdf\)](#)

### Previous editions of the Workshop

The ANLN Workshop was previously held at ICC 2013 in Budapest ([link to program](#)), at ICC 2014 in Sydney, Australia ([link to program](#)), at ICC 2015 in London, UK ([link to program](#)), and at ICC 2016 in Kuala Lumpur, Malaysia ([link to program](#)).

## Preliminary program

Thursday, May 25

### 09:00 - 09:45: WT03-S1: Morning Keynote

Keynote address by Prof. José M. F. Moura. Topic and abstract will be provided shortly.

### 09:45 - 10:30: WT03-S1b: Signal processing for Localization and Navigation

A Novel Message Passing Algorithm for Online Bayesian Filtering: Turbo Filtering  
 Giorgio M. Vitetta, Emilio Sirignano and Francesco Montorsi (University of Modena and Reggio Emilia, Italy)

Factor Graph Based Simultaneous Localization and Mapping using Multipath Channel Information  
 Erik Leitinger (Lund University & Graz University of Technology, Austria); Florian Meyer (Massachusetts Institute of Technology, USA); Fredrik Tufvesson (Lund University, Sweden); Klaus Witrisal (Graz University of Technology, Austria)

Mitigating Unbalanced GDoP Effects in Range-Based Vehicular Cooperative Localization  
 Minh Gia Hoang (CEA-Leti Minatec & EURECOM, France); Benoit Denis (CEA-Leti Minatec, France); Jérôme Härrä and Dirk Slock (EURECOM, France)

### 11:00 - 12:30: WT03-S2: Fundamental Limits and Parameter Estimation Techniques

On the Trade-off Between Positioning and Data Rate for mm-Wave Communication  
 Giuseppe Destino (University of Oulu, Finland); Henk Wymeersch (Chalmers University of Technology, Sweden)

Towards Counting via Passive Radar using OFDM Waveforms  
 Stefania Bartoletti (ENDIF University of Ferrara, Italy); Andrea Conti (ENDIF University of Ferrara, WiLAB University of Bologna, Italy); Moe Win (Massachusetts Institute of Technology, USA)

On the Impact of Beamforming Strategy on mm-Wave Localization Performance Limits  
 Anna Guerra (University of Bologna, Italy); Francesco Guidi (CEA LETI, France); Davide Dardari (University of Bologna, Italy)

Impact of Frequency-Hopping NB-IoT Positioning in 4G and Future 5G Networks  
 José A. del Peral-Rosado (Universitat Autònoma de Barcelona, Spain); José A. López-Salcedo (Universitat Autònoma de Barcelona, Spain); Gonzalo Seco-Granados (Universitat Autònoma de Barcelona, Spain)

Towards a Characterization of Localization Performance in Networks with Random Geometries  
 Christopher E O'Lone (Virginia Polytechnic Institute and State University, USA); Michael Buehrer (Virginia Tech, USA)

Understanding the Efficiency of Cooperation in Location-aware Wireless Networks  
 Yifeng Xiong and Jingming Kuang (Beijing Institute of Technology, P.R. China); Yuan Feng (Science Research Institute of China North Industries Group Corporation, P.R. China); Hua Wang (Modern Comm. Lab, P.R. China); Nan Wu (Beijing Institute of Technology, P.R. China)

**14:00 - 14:45: WT03-S3: Afternoon Keynote**

Dr. Christos Laoudias: Cellular Network Localization: Current Challenges and Future Directions

**Abstract:**

Positioning technologies are important to cellular operators for enabling a variety of network planning and optimization features, while offering the opportunity to open new revenue streams through the monetization of user location data. This talk will first discuss industry interests with respect to the requirements of operators in existing location-dependent processes and envisioned location-aware application scenarios ranging from network event root cause analysis to indoor gaming and retail analytics. The technology landscape will be outlined next through an overview of commercial localization solutions for network operators. In the following, selected technical challenges in user/event localization will be presented focusing on solutions that leverage the high volume of measurement reports recorded at the network side as part of standard network operation. Such challenges include indoor/outdoor identification, 3D location, and mobility state estimation among others. Finally, future directions related to network-based positioning will be discussed in view of recent industry trends, such as network densification, and upcoming communication technologies in the context of 5G that can be greatly assisted by the availability of user location information.

**Biography:**

Dr. Christos Laoudias has recently joined the KIOS Research and Innovation Center of Excellence at the University of Cyprus contributing to various projects related to localization, tracking, and navigation in telecommunication and smart camera networks. Before that he was leading the geolocation technology research in Huawei Ireland Research Center working on the design of data-driven positioning solutions for cellular network planning and optimization. He holds a Diploma in Computer Engineering and Informatics (2003) and a M.Sc. in Integrated Hardware and Software Systems (2005) from the University of Patras, Greece, and a Ph.D. in Computer Engineering from the University of Cyprus (2014). During his Ph.D. he coached the development of several award-winning indoor localization prototype systems, which have been released under open-source license, and for his doctoral research work he received the Alpha Bank Cyprus Award for "Creative Research and Innovation". His research interests include positioning and tracking technologies, mobile and pervasive location-awareness, fault-tolerant location estimation, and location-based services.

**14:45 - 15:30: WT03-S3b: Methods and Algorithms for Data fusion and Cooperative Localization**

Poster Session (The format for the poster presentations will be communicated with the authors shortly)

**Probabilistic Multipath Mitigation in RSSI-based Direction-of-Arrival Estimation**

Thorsten Nowak (Friedrich-Alexander-Universität Erlangen-Nürnberg); Markus Hartmann (Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany); Hans-Martin Tröger and Lucila Patino-Studencki (Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany); Jörn Thielecke (Friedrich-Alexander-Universität Erlangen-Nürnberg)

**Direct Position Determination of Multiple Targets via Reduced-dimension Beamspace**

Zihang Cheng (Tsinghua University, P.R. China); Yunlong Wang (National Digital Switching System Engineering & Technological Research Center, P.R. China); Yuan Shen (Tsinghua University, P.R. China)

**Weighted Online Calibration for Odometry of Mobile Robots**

Grigori Goronzy (Lübeck University of Applied Sciences, Germany); Horst Hellbrueck (Lübeck University of Applied Sciences & CoSA Research Group, Germany)

**Experimental Results of a Combined TDOA/TOF Technique for UWB Based Localization Systems**

Rami Mazraani (AED Engineering, Germany); Daniel Knobloch (BMW, Germany); Leonardo Govoni and Manuel Saez (AED Engineering, Germany)

**Near-Far Field Multipath Spatial-Temporal Localisation**

Evangelos Venieris and Athanassios Manikas (Imperial College London, United Kingdom)

**Cholesky MDS: A Fast and Efficient Heterogeneous Localization Algorithm**

Alireza Ghods, Giuseppe Abreu and Stefano Severi (Jacobs University Bremen, Germany)

**Location Privacy Protection in Asynchronous Localization Networks by Resource Allocation Approaches**

Xiaojing Li, Tingting Zhang and Dan Ma (Harbin Institute of Technology, Shenzhen Graduate School, P.R. China); Bin Cao (Harbin Institute of Technology, P.R. China); Qinyu Zhang (Shenzhen Graduate School, Harbin Institute of Technology, P.R. China)

**Direct Multi-Array and Multi-Tone Positioning**

Niels Hadaschik (Fraunhofer Institute for Integrated Circuits, Germany); Benjamin Sackenreuter (Fraunhofer IIS, Germany); Marc Faßbinder (Fraunhofer Institute for Integrated Circuits, Germany)

**16:00 - 17:30: WT03-S4: Testbeds and Experimentation****ORION: Orientation Estimation Using Commodity Wi-Fi**

Mohamed Naoufal Mahfoudi (Université Côte d'Azur Inria Sophia Antipolis, France); Thierry Turletti (INRIA & Université Côte d'Azur, France); Thierry Parmentelat (INRIA & INRIA, France); Fabien Ferrero (University Nice Sophia Antipolis, CNRS, LEAT & CREMANT, France); Leonardo Lizzi (Université Côte d'Azur, CNRS, LEAT, France); Robert Staraj (Université Côte d'Azur, CNRS, LEAT, France); Walid Dabbous (INRIA, France)

**Using DecaWave UWB Transceivers for High-accuracy Multipath-assisted Indoor Positioning**

Josef Kulmer and Stefan Hinteregger (Graz University of Technology, Austria); Bernhard Grosswindhager (Technical University Graz, Austria); Michael Rath (Graz University of Technology, Austria); Mustafa Bakr (Technical University Graz, Austria); Erik Leitinger (Lund University & Graz University of Technology, Austria); Klaus Witrisal (Graz University of Technology, Austria)

Distributed Software Defined Radio Testbed for Real-time Emitter Localization and Tracking  
 Johannes Schmitz, Felix Bartsch, Manuel Hernández and Rudolf Mathar (RWTH Aachen University, Germany)

Tracking of frequency selectivity for device-free detection of multiple targets  
 Sanaz Kianoush (National Research Council of Italy (CNR), Italy); Stefano Savazzi (National Research Council of Italy (CNR) & Politecnico di Milano, Italy); Vittorio Rampa (IEIIT - CNR - Dipartimento di Elettronica e Informazione, Italy)

Synchronization of Wireless Sensor Networks Utilizing Broadcast Signal Time Stamps  
 Hans-Martin Tröger and Florian Schmittner (Friedrich-Alexander Universität Erlangen-Nürnberg, Germany); Thorsten Nowak (Friedrich-Alexander Universität Erlangen-Nürnberg); Joerg Robert (Friedrich-Alexander Universität Erlangen-Nürnberg, Germany); Albert Heuberger (Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany)

Indoor Positioning based on Ranging Offset Model and Learning  
 Shenghong Li and Mark Hedley (CSIRO, Australia); Iain B. Collings (Macquarie University, Australia); David Humphrey (CSIRO, Australia)

Distributed Localization for Interconnected Devices: An Iterative Linear Solution

José M. F. Moura

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May 25, 2017

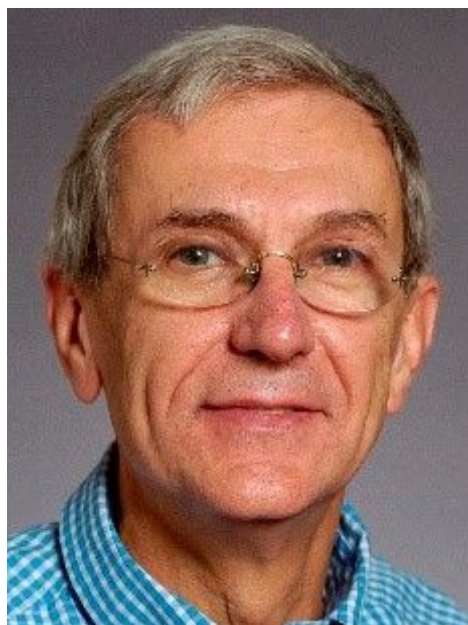
IEEE ICC 2017 Workshop on Advances in Network Localization and Navigation

Paris, France

Joint work with Usman Khan (Tufts University) and Soumya Kar (CMU)

IoT interconnects ever more physical devices that are instrumented with embedded electronics, sensors of different modalities, and actuators. To make full use of IoT and expand the range of potential applications, for example, tracking resources deployed in Hospital environments, or to manage deployed assets, it is important to localize them efficiently, not only outdoors, but, and increasingly more relevant, indoors where GPS is not available. To minimize infrastructure, communications, and power needs, these instrumented devices should cooperate with other nearby objects. In this keynote, I will present a distributed (cooperative) solution that solves the essentially nonlinear localization (triangulation) problem by an iterative linear algorithm that asymptotically converges to the correct localization of each and every device. I will discuss the minimal requirements for convergence and extensions of the basic algorithm to account for motion and noise.

Ref.: Khan, Kar, and Moura, IEEE Access 2015, IEEE Trans. Signal Processing, 2010, 2009.



José M. F. Moura, [www.ece.cmu.edu/~moura](http://www.ece.cmu.edu/~moura), is the Philip L. and Marsha Dowd University Professor at CMU, with interests in signal processing and data science. He invented (with Alek Kavcic) a patented detector found in at least 60% of the disk drives of all computers sold worldwide in the last 13 years (over 3 billion and counting) – the subject of the recent settlement (February 2016) of \$750 Million between CMU and Marvell, the largest settlement ever in the information technologies IP area and 3rd largest overall. He is (2016) IEEE VP for Technical Activities, IEEE Board Director, and was President of the IEEE Signal Processing Society (SPS), and Editor in Chief for the Transactions on SP. Moura received the IEEE SPS Technical Achievement Award and Society Award. He is Fellow of the IEEE and of AAAS, corresponding member of the Academy of Sciences of Portugal, Fellow of the US National Academy of Innovators, and member of the US National Academy of Engineering.

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