International Conference on Localization and GNSS

Program

22 – 24 June 2015
Chalmers University of Technology
Gothenburg, Sweden
Organization

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Chalmers University of Technology
Sweden

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A Welcome Message from the General Chair

On behalf of the Organizing and Program Committees, I welcome you to the International Conference on Localization and GNSS, at Chalmers University of Technology in Gothenburg, Sweden.

ICL-GNSS brings together researchers and practicing professionals in the broad area of positioning, to share ideas, make contacts, and foster new collaborative links for the future. The TPC Co-Chairs, Elena Simona Lohan, Jan Johansson, and Lennart Svensson, have done an excellent job in leading the review process, which resulted in a selection of 33 technical contributions from a total of 68 submissions. In addition, we have four world-class keynotes from leaders in the field of localization and GNSS. The technical program is complemented by two social events. On Monday night, The City of Gothenburg hosts a reception in Dicksonka Palatset, and on Tuesday evening we will enjoy a boat tour of the Gothenburg archipelago, during which a dinner will be served.

We are grateful to our sponsors, Uniquesec and the Information and Communication Technology Area of Advance at Chalmers, whose contributions enabled us to provide you with what we hope will be an unforgettable experience. We also thank the Gothenburg City Council for sponsoring the welcome reception. In addition, the event has received technical co-sponsorship from the IEEE Sweden VT, COM, IT Joint Societies Chapter, enabling us to publish the proceedings into IEEEXplore.

I would like to thank the Technical Program Committee, for providing timely and high-quality reviews; the Publication Chair, José A. López-Salcedo, for the smooth interaction with IEEEXplore; the Finance Chair, Erik Ström, for carefully balancing our budget; and the Local Arrangements Chair, Fredrik Brännström, for organizing the venue and social events.

This only leaves me to wish you an enjoyable and intellectually stimulating time in Sweden's second city, during the International Conference on Localization and GNSS.

Henk Wymeersch, General Chair
Keynote Speakers

Monday June 22, 09:20

Network Localization and Navigation: a new paradigm for wireless applications
Professor Moe Z. Win, Massachusetts Institute of Technology, United States

Abstract: The availability of positional information is of extreme importance in numerous wireless applications. The coming years will see the emergence of location-aware networks with sub-meter localization accuracy, minimal infrastructure, and robustness in harsh (GPS challenged) environments. To reach this goal we advocate network localization and navigation, a new paradigm that exploits a combination of wideband transmission and spatiotemporal cooperation. Our work has addressed this problem from three perspectives: theoretical framework, cooperative algorithms, and network experimentation. We will give an overview of our recent research results in this exciting field.

Monday June 22, 13:00

A Multi-Constellation future for GNSS
Professor Terry Moore, University of Nottingham, United Kingdom

Abstract: For many years now the only operational satellite navigation system has been GPS, and this has become accepted as the global standard. However, these days it is more appropriate to talk about Global Navigation Satellite Systems (GNSS), because the United States GPS has been joined by the Russian, European, Chinese, Indian and Japanese systems. Multi-constellation GNSS receivers are now starting to become readily available. During the 1990’s a number of professional grade GPS / GLONASS receivers were commercially available. But, these had quite a limited impact and with the dramatic decline in the number of GLONASS between 1995 and 2001 the interest in combined receivers waned. However, the last few years has seen a dramatic re-emergence of the development of GPS and GLONASS receivers. Indeed, many of this new generation of receivers are now truly multi-constellation receivers, and have the capability to operate with Galileo and BeiDou as these systems become operational. This presentation will review the current status and proposed modernisation of GPS with an emphasis on the benefits that the developments and new signals will bring to a variety of user domains. In a similar manner, the Russian GLONASS will also be described documenting the evolution to the system’s current status and the planned developments. The new European Galileo and Chinese BeiDou systems will be described along with consideration of the international efforts directed towards interoperability of all the global systems. Other nascent and proposed systems will also be introduced, such as IRNSS and QZSS.

Tuesday June 23, 09:00

Localization, from phone to drone
Professor Fredrik Gustafsson, Linköping University, Sweden

Abstract: Local positioning systems will be a complement to global (satellite-based) positioning systems for use indoors, underground or even outdoors when relative position between objects is needed with high integrity. The trend is to harvest on existing infrastructure, such as cellular radio networks, and to complement with cheap beacons (Bluetooth, UWB, etc) when needed. The presentation will describe a localisation framework based on the marginalised particle filter, to handle complex scenarios with severe nonlinear sensor models and non-Gaussian measurement noise. The theory is illustrated with a wide range of applications, from indoor pedestrians, migrating birds, to a recent thrust to localise rangers, poachers and rhinos in Africa using a variety of sensors, from phone to drone!

Tuesday June 23, 13:00

The Drive Me project – self driving vehicles and the need of positioning
Erik Coelingh, Volvo Car Corporation, Sweden

Abstract: Volvo Cars plays a leading role in the world’s first large-scale autonomous driving pilot project in which 100 self-driving Volvo cars will use public roads in everyday driving conditions around the Swedish city of Gothenburg. This project called ‘Drive Me – Self-driving cars for sustainable mobility’ and aims to pinpoint the societal benefits of autonomous driving. The pilot will involve self-driving cars using approximately 50 kilometers of selected roads in and around Gothenburg. These roads are typical commuter arteries and include motorway conditions and frequent queues. Vehicle positioning techniques play a key role in making a vehicle drive itself. This presentation describes the need for positioning, the requirements and outlines some of the selected solutions.
Venue and General Information

Göteborg - the Swedish name of Gothenburg - is the second-largest city in Sweden (after Stockholm). Situated on the south-west coast of Sweden, the city has approximately 500 000 inhabitants in the urban area. Gothenburg has a feel of a big city with a small town charm. The closeness to the sea with its unique archipelago, the wide selection of culture entertainment, attractions, sports events, restaurants, shops and cafes makes it one of Sweden's most popular cities.

The International Conference on Localization and GNSS will take place at Chalmers University of Technology on campus Johanneberg.

Address

Chalmersplatsen 1
Chalmers University of Technology
412 96 Gothenburg, SE
Phone (switchboard) +46 31 772 1000

Localities for conference

Conference desk: Volvo foyer 2nd floor
Technical Sessions: Runan 2nd floor
Lunches & coffee breaks: Volvo foyer 2nd floor

Conference desk

Registration opens at 08.30 on June 22. The conference desk will be kept opened during the conference in connection with the sessions. We kindly ask you to wear the name badge during the conference.

Telephone: +46 (0) 31 772 1780 ; +46 (0) 72 931 4009
Taxis: (i) Taxikurir: +46 (0) 31 27 27 27   (ii) Taxi Göteborg: +46 (0) 31 650 000

Internet access

If you have access to eduroam network at your home university you can use it without any changes. If you do not have access to eduroam you will receive username and password for internet access at the conference desk.

In case of emergency call 112
Social Events

Welcome Reception – Monday June 22, 19:30-20:30

All conference delegates are invited by the city of Gothenburg to a welcome reception at Dicksonska Palatset. A light buffet will be served.

Address: Dicksonska Palatset, Parkgatan 2, Göteborg

Directions: From tram stop Chalmers, Platform A, take Tram 7 or Tram 10 until tram stop Valand. From Valand, a 4 minute-walk will take you to Dicksonska Palatset.

Boat tour in Gothenburg’s archipelago – Tuesday June 23, 18:00 – 22:00

Experience many of the beautiful islands of Gothenburg’s archipelago onboard the steamer BOHUSLÄN.

Welcome drink and dinner will be served onboard the boat. All guests are welcome to visit the engine room and watch the steam engine in work or climb the steep steps up to boat deck and look at the wheel house and meet the captain. BOHUSLÄN is the last passenger steamer on the Swedish west coast as well as Sweden’s largest steam engine-operated vessel in regular traffic.

Address: Packhuskajen 11, Gothenburgs harbour

Directions: from tram stop Chalmers, Platform A, take tram 10 until tram stop: Lilla Bommen. From Lilla Bommen, an 11-minute walk will take you to Packhuskajen 11. The place is located past the Opera house and besides the Casino Cosmopol.

The welcome reception and Boat tour & Banquet dinner are included in the registration fee. You will find the admittance tickets for the events in your welcome bag, as well as a public transportation card.
Monday, June 22

09:20 - 10:20 Keynote 1

Network Localization and Navigation: a new paradigm for wireless applications
Professor Moe Z. Win, Massachusetts Institute of Technology, United States

10:20 - 10:40 Coffee/Tea Break

10:40 - 12:00 Session 1 – Indoor Localization
Chair: Lennart Svensson (Chalmers University of Technology, Sweden)

1. A Step Length Estimation Model for Position Tracking
   Sun, Yi; Wu, Huaming; Schiller, Jochen (Freie Universität Berlin, Germany)

2. MAP RSS Based Joint Localization and Model Identification under Spatially Autocorrelated Noise
   Vallet García, José M. (Finnish Geospatial Research Institute, Finland)

3. PocketSLAM based on the Principle of the FootSLAM Algorithm
   Kaiser, Susanna; Muñoz Díaz, Estefania (DLR, Germany)

4. Towards Indoor Localization of Pedestrians via Smart Building Vibration Sensing
   Poston, Jeffrey; Schloemann, Javier; Buehrer, R. Michael; Malladi, V. V. N. Sriram; Woolard, Americo; Tarazaga, Pablo (Virginia Tech, USA)

12:00 - 13:00 Lunch

13:00 - 14:00 Keynote 2

A Multi-Constellation future for GNSS
Professor Terry Moore, University of Nottingham, United Kingdom

14:00 - 15:40 Session 2 – IMU and UWB Localization
Chair: Enrico Paolini (University of Bologna, Italy)

   Khan, Waqas; Piché, Robert; Lohan, Elena-Simona (Tampere University of Technology, Finland)

   Panahandeh, Ghazaleh; Händel, Peter (KTH Royal Institute of Technology, Sweden)

   Ngo, Quoc-Tuong (1); Roussel, Pierre (1); Denby, Bruce (1,2); Dreyfus, Gerard (1) (1: ESPCI ParisTech, Paris, France; 2: Université Pierre et Marie Curie, Paris, France)

8. Multiple Target Tracking with Particle Filtering in UWB Radar Sensor Networks
   Sobhani, Bita; Paolini, Enrico; Mazzotti, Matteo; Giorgetti, Andrea; Chiani, Marco (University of Bologna, Italy)

9. Source Localization Using Virtual Antenna Arrays
   Yaqoob, Muhammad Atif (1); Mannesson, Anders (2); Butt, Naveed R. (3); Tufvesson, Fredrik (1) (1: Dept. of Electrical and Information Technology, Lund University, Lund, Sweden; 2: Dept. of Automatic Control, Lund University, Lund, Sweden; 3: Ericsson AB, Lund, Sweden)

15:40 – 16:00 Coffee/Tea Break
16:00 - 18:00 Session 3 – GNSS Receiver Design

Chair: Jan Johansson (SP, Sweden)

10. **Performance Assessment of an ARM-based Dual-Constellation GNSS Software Receiver**
    Troglio Gamba, Micaela; Nicola, Mario; Falletti, Emanuela (ISMB- Istituto Superiore Mario Boella, Italy)

11. **A-contrario Approach for Outlier Detection in GNSS Positioning**
    Zair, Salim; Le Hegarat, Sylvie; Seignez, Emmanuel (1: Université Paris Sud, France; 2: Finnish Geospatial Research Institute, Finland)

12. **GNSS Orbit Prediction with Enhanced Force Model**
    Pukkila, Andrei; Ala-Luhtala, Juha; Piché, Robert; Ali-Löytty, Simo (Tampere University of Technology, Finland)

13. **GPS-based Attitude Determination Using RLS and LAMBDA Methods**
    Oliazadeh, Naisy; Jr. Landry, Rene; A. Yeste-Ojeda, Omar (Ecole de Technologie Superieur, Canada)

    Egea-Roca, Daniel; Seco-Granados, Gonzalo; López-Salcedo, José A. (Universitat Autònoma de Barcelona, Spain)

15. **Indoor GPS Positioning Using A Slowly Moving Antenna and Long Coherent Integration**
    Gowdayyanadoddi, Naveen Shivaiah (1); Broumandan, Ali (1); Lachapelle, Gérard (1); Curran, James T (2) (1: Position, Location and Navigation -PLAN- Group, University of Calgary, Canada; 2: European Commission, Joint Research Center, Ispra, Italy)

19:30 Welcome reception

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**Tuesday, June 23**

09:00 - 10:00 Keynote 3

*Localization, from phone to drone*
Professor Fredrik Gustafsson, Linköping University, Sweden

10:00 - 10:20 Coffee/Tea Break

10:20 - 11:40 Session 4 – Wi-Fi based Localization

Chair: Daniele Borio (European Comission, Joint Research Center - JRS)

16. **Experimental Evaluation of RF-based Indoor Localization Algorithms Under RF Interference**
    Lemic, Filip (1); Handziski, Vlado (1); Wolisz, Adam (1); Constantbeys, Timoth- eos (2); Laoudias, Christos (3); Adler, Stephan (4); Schmitt, Simon (4); Yang, Yuan (4) (1: Telecommunication Networks Group, Technical University of Berlin, Germany; 2: Department of Computer Science, University of Cyprus, Cyprus; 3: KIOS Research Center for Intelligent Systems and Networks, University of Cyprus, Cyprus; 4: Department of Mathematics and Computer Science, Freie Universität Berlin, Germany)

17. **Are all the Access Points necessary in WLAN-based indoor positioning?**
    Laitinen, Elina; Lohan, Elena Simona (Tampere University of Technology, Finland)

18. **Lighthouse: Accurate 802.11 Localization using Directional Beacon Fingerprinting**
    Siddig, AbuBakr; Makki, Ahmed; Bleakley, Chris (UCD, Ireland)
19. A Computationally Efficient Approach to WLAN Localization based on Multiple Filters
Renzulli, Pietro; Restaino, Rocco; Addesso, Paolo (University of Salerno, Italy)

11:40 - 13:00 Lunch

13:00 - 14:00 Keynote 4

The Drive Me project - Self driving vehicles and the need for positioning
Erik Coelingh, Volvo Car Corporation, Sweden

14:00 - 15:40 Session 5 – Multi-pos Special Session

Chair: Jari Nurmi (Tampere University of Technology)

20. Receiver Architecture for Cognitive Positioning with CDMA and OFDM signals
Figueiredo e Silva, Pedro Manuel (1); Seco-Granados, Gonzalo (2); Simona-Lohan, Elena (1) (1: Tampere University of Technology, Finland; 2: Universitat Autònoma de Barcelona, Spain)

21. Received Signal Strength models for WLAN and BLE-based indoor positioning in multi-floor buildings
Lohan, Elena-Simona; Talvitie, Jukka; Figueiredo e Silva, Pedro; Nurminen, Henri; Ali-Loïtty, Simo; Piché, Robert (Tampere University of Technology, Finland)

22. On the Separation of Timescales in Radio-based Positioning
Frohle, Markus; Wymeersch, Henk (Chalmers University of Technology, Sweden)

23. Relaxed Direct Position Estimation as Strategy for Open-Loop GNSS Receivers
Daniel, Ondrej; Lohan, Elena-Simona; Nurmi, Jari (Tampere University of Technology, Finland)

24. Indoor Positioning Technology Assessment using Analytic Hierarchy Process for Pedestrian Navigation Services
Basiri, Anahid (1); Peltola, Pekka (1); Silva, Pedro Figueiredo (2); Lohan, Elena Simona (2); Moore, Terry (1); Hill, Chris (1) (1: The University of Nottingham, United Kingdom; 2: Tampere University of Technology, Finland)

15:40 - 16:00 Coffee/Tea Break

16:00 - 17:00 Session 6 – LTE Positioning

Chair: José A. López-Salcedo (Universitat Autònoma de Barcelona)

25. Baseline Performance of LTE Positioning in 3GPP 3D MIMO Indoor User Scenarios
Rydén, Henrik; Modarres Razavi, Sara; Gunnarsson, Fredrik; Min Kim, Su; Wang, Meng; Blankenship, Yufei; Grövlen, Asbjörn; Busin, Ake (Ericsson AB, Sweden)

26. Downlink Synchronization of LTE Base Stations for Opportunistic ToA Positioning
del Peral-Rosado, José A. (1); López-Salcedo, José A. (1); Seco-Granados, Gonzalo (1); Crosta, Paolo (2); Zanier, Francesca (2); Crisci, Massimo (2), (1: Universitat Autònoma de Barcelona, Spain; 2: European Space Agency (ESA), The Netherlands)

27. Genetic Algorithm Optimized Grid-based RF Fingerprint Positioning in Heterogeneous Small Cell Networks
Mondal, Riaz Uddin (1); Ristaniemi, Tapani (1); Turkka, Jussi (2), (1: University of Jyväskyla, Finland; 2: Magister Solutions Ltd., Tampere, Finland)

18:00 Dinner/Boat Tour
Wednesday, June 24

09:00 - 10:00 Session 7 – GNSS interference and spoofing countermeasures
Chair: Robert Piché (Tampere University of technology)

28. Real-time Jamming Detection using the Sum-of-Squares Paradigm
   Borio, Daniele; Gioia, Ciro (European Commission, Joint Research Centre, Italy)

29. Results on GNSS Meaconing Detection with Multiple COTS Receivers
   Axell, Erik; Alexandersson, Mikael (Swedish Defence Research Agency - FOI, Sweden)

30. GNSS Receiver Tracking Performance Analysis under Distance-Decreasing Attacks
   Zhang, Kewei; Papadimitratos, Panos (KTH Royal Institute of Technology, Sweden)

10:00 - 10:20 Coffee/Tea Break

10:20 - 11:20 Session 8 – Positioning for autonomous systems
Chair: Henk Wymeersch (Chalmers University of Technology)

31. Statistical Trilateration with Skew-t Errors
   Müller, Philipp; Piché, Robert (Tampere University of Technology, Finland)

32. Relative Train Localization for Cooperative Maneuvers using GNSS Pseudoranges and Geometric Track Information
   Zeller, Paul; Sieber, Benjamin; Lehner, Andreas; Sand, Stephan (German Aerospace Center - DLR, Germany)

33. Proof-of-Concept of the Local Integrity Approach - Prototype Implementation and Performance Assessment in an Urban Context
   Margaria, Davide; Falletti, Emanuela (Istituto Superiore Mario Boella - ISMB, Torino, Italy)

12:00 - 13:30 Best Paper announcement and presentation of ICL-GNSS 2016
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