Navigation and Localization for Intelligent Transportation Systems

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Abstract—As contemporary applications such as driverless cars or autonomous shipping are called to revolutionize Intelligent Transportation Systems (ITS), there is a growing need on the provision of precise, continuous and reliable navigation information. The Special Session on "Navigation and Localization for ITS" addresses the latest research on positioning solutions, Global Navigation Satellite Systems (GNSS), multi-sensor data fusion and localization methods, to enable both seamless navigation information, and next-generation localization systems for ITS. This Special Session will be held at the IEEE ITSC'21 Conference in Indianapolis, IN, United States.

Index Terms—Navigation, Localization, Global Navigation Satellite System (GNSS), Multi-Sensor Data Fusion.

I. INTRODUCTION

RELIABLE positioning and navigation are becoming crucial in safety-critical applications within the ITS. The third edition of the "Navigation and Localization for Intelligent Transportation Systems" Special Session aims to provide with the latest algorithms and solutions based on satellite, inertial, 5G and other means of navigation to comply with the stringent navigation requirements of autonomous vehicles. In addition, the Special Session also targets the latest advances on filtering solutions. This special session will take place on the 24th Edition of the IEEE ITS Conference in Indianapolis, IN, United States.

II. SCOPE AND GOALS

Location-based services, alongside with the modern applications on Intelligent Transportation Systems require reliable, continuous and precise navigation, positioning and timing information for their successful operation and implantation in the market. The goal of the Navigation and Localization on ITS Special Session is gathering the most relevant advances on algorithms and solutions to comply with the navigation requirements of safety-critical applications: automated landing on aviation, driverless autos, small autonomous robots, or unmanned air vehicles (UAVs).

Despite GNSS being the main source of positioning data in open sky conditions, its vulnerabilities to radio interference and signal reflection limit its use for safety-critical applications. For this reason, enhancing conventional GNSS navigation systems to include other sensing modalities and exploit signals of opportunity (SOP) has become a necessity. Articles on new strategies for multi-sensor data fusion, innovative solutions for Kalman and particle filtering, mechanisms for outlier detection, and countermeasures to radio interference are invited into this Special Session.

Furthermore, the use of SOP (e.g. LTE or 5G cellular networks) and active sensors (e.g, RADAR or LiDAR) for navigation is of fundamental importance to assure reliable and seamless navigation in GNSS challenging scenarios, such as urban canyons or indoors. Contributions on opportunistic navigation are welcomed for the participation on this Special Session. In addition to standalone navigation, the use of cooperative positioning methods, or feedback from external localization systems, can improve the overall navigation capabilities, thus being a cutting-edge research field of interest in this Special Session.

III. TOPICS OF INTEREST

The scientific community, as well as experts in the navigation and signal processing fields are being contacted and invited to submit their contributions to this Special Session. The organizing team encourages submissions on the following (non-exhaustive) list of topics:

- Innovative uses of GNSS positioning.
- Exploiting SOP and/or LiDAR for localization.
- Cooperative and swarm-based navigation methods.
- Localization in GNSS-denied or indoor scenarios.
- Advanced filtering solutions for tracking or navigation.

IV. HISTORY & DISSEMINATION PLAN

The first two editions of the "Navigation and Localization for Intelligent Transportation Systems" Special Sessions took place at the 22nd and 23rd editions of the ITSC, organized in Auckland (New Zealand) and virtually respectively. As a result, a total of four sessions were organized and over 15 papers were presented along these two past years. Based on the previous years success and the declared interests of invited authors, it is expected a minimum number of 10 manuscripts submitted for the proposed Special Session.

Upon approval, the organizers will disseminate the CfP among their peers from diverse international institutions, encouraging the submission of contributions. Moreover, the CfP will be also distributed through standard dissemination channels for the navigation, robotics and signal processing communities.

ABOUT THE PROPOSERS

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Daniel Medina (daniel.ariasmedina@dlr.de) is a research fellow at the Institute of Communications and Navigation of the German Aerospace Center (DLR). He received the B.Eng in Electrical Engineering from the University of Malaga and the M.Eng in Computer Science from Carlos III University of Madrid in 2014 and 2016 respectively. Currently, he is on the verge of completing his PhD on sensor fusion for robust navigation under signal-degraded scenarios. His research interests include GNSS carrier-phase attitude determination, high accuracy applications and robust estimation. He is Vice-Chair of the IEEE ITSS German Chapter.

Dr. Pau Closas (closas@northeastern.edu) is Assistant Professor in Electrical and Computer Engineering at Northeastern University, Boston MA. He received the M.Sc. and Ph.D. in Electrical Engineering from UPC in 2003 and 2009, respectively. He also holds a M.Sc. in Advanced Maths and Mathematical Engineering from UPC since 2014. He is the recipient of the EURASIP Best PhD Thesis Award 2014, the 9th Duran Farell Award for Technology Research, and the 2016 ION's Early Achievements Award, for contributions to signal processing for GNSS. His primary areas of interest include statistical signal processing, stochastic filtering, robustness analysis, and game theory, with applications to positioning systems, wireless communications, and mathematical biology. Pau Closas is Senior Member of the IEEE, the EURASIP and the ION. He has been involved in the organizing committees of a number of conference such as EUSIPCO'11, IEEE SSP'16, EUSIPCO'19, or IEEE ICASSP'20.