IEEE/ASME TRANSACTIONS ON

MECHATRONICS

Call for Papers
Focused Section on
Intelligent Perception and Multi-source Navigation for Unmanned Systems

As a typical autonomous mechatronics application platform, unmanned systems (UAVs, UGVs, UUVs, etc.) often need to cope with disturbances and uncertainties in complex environments, and the quality of their mission fulfillment relies on intelligent and resilient Positioning, Navigation and Timing (PNT) services. *Intelligent Multi-source Autonomous Navigation* (*IMAN*) technology is able to provide robust, accurate, and adaptive PNT information for unmanned systems through the perception, fusion, decision-making, and evaluation of various navigation information sources, such as GNSS, SINS, magnetic sensor, visual sensor, barometer, radio sensors, etc. This technology represents a crucial direction for the development of PNT user terminal. However, in order to realize *IMAN technology* with "plug-and-play" functionality and seamless switching among scenarios, several urgent issues must be addressed: *1)* creating a unified perception framework that is compatible with and integrates multi-source heterogeneous sensors at both hardware and software levels; *2)* developing multi-source information fusion algorithms with autonomous disturbance-rejection, fault-tolerance and intelligent reconfiguration capabilities; *3)* autonomously determining trustworthiness of navigation decisions (e.g., accessing, switching navigation information sources, downgrading navigation strategies, etc.); *4)* establishing a comprehensive performance index system and monitoring system at the sensor level, module level and system level. To promote the development of *IMAN* technology, IEEE/ASME TMECH will publish a Focused Session, which will provide a platform for researchers, engineers, and industrial practitioners to share their latest research findings in the field of unmanned systems autonomous navigation. The topics of interest within the scope of this Focused Section include, but not limited to, the following:

- Sensor error mechanism research and model construction for multi-source heterogeneous navigation system;
- Sensors compatibility check, interference detection, fault detection and attack detection for multi-source navigation systems;
- Estimation, compensation and suppression of multi-source heterogeneous disturbances in complex environment;
- Fault diagnosis and isolation of multi-source autonomous navigation systems;
- Intelligent reconfiguration of navigation system and dynamic sensor weights allocation under sensor failures;
- Composite disturbance filtering (CDF) algorithm considering non-Gaussian, non-IID noise;
- Vehicle dynamics model (VDM)-assisted evaluation of multi-source autonomous navigation decisions;
- Seamless switching among multiple navigation information sources for unmanned systems across media (aerial-aquatic) and scenarios (indoor, outdoor, etc.);
- Application of IMAN system in complex scenarios such as GNSS denial, complex underground road network and underwater long-endurance exploration, etc.;
- IMAN system which integrates quantum navigation, brain-like bionic navigation, collective intelligence-inspired navigation and other new navigation technologies.

Manuscript Preparation:
Papers must contain original contributions and be prepared in accordance with TMECH standards. Instructions for authors are available online at: http://www.ieee-asme-mechatronics.org

Manuscript Submission:
Manuscripts should be submitted through the online submission service available at: http://mc.manuscriptcentral.com/tmech-ieee. The cover letter should report the following statement: "*This paper is submitted for possible publication in the Focused Section on Intelligent Perception and Multi-source Navigation for Unmanned Systems"*. All manuscripts will be subjected to a peer review process.

Important Dates:

Paper Submission	February 1, 2025
Completion of First Review	April 1, 2025
Submission of Revised Papers	May 15, 2025
Completion of Final Review	July 1, 2025
Submission of Final Manuscripts and Copyright Forms	August 1, 2025
Publication	October, 2025

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