

# **28th International Technical Meeting of the Satellite Division of the Institute of Navigation (ION GNSS 2015)**

Tampa, Florida, USA  
14-18 September 2015

Volume 1 of 5

ISBN: 978-1-5108-1725-8

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Donna Cowell Senft, Kevin Slimak and Lawrence "Robbie" Robertson - <i>Best Presentation</i>	
<a href="#"><u><b>Galileo as Measured Performance after 2015 Ground Segment Upgrade</b></u></a>	1940 - 1946
D. Blonski, G. Galluzzo, J. Hahn, S. Binda, R. Lucas, M. Hollreiser, E. Spinelli, N. Sirikan, M. Kirchner, M. Goetzmann, J. Kueger, M. Eleuteri, M. Gasbarra	
<a href="#"><u><b>Galileo Ephemeris Consolidation and Control Analysis – GECCO</b></u></a>	1947 - 1957
Cedric Rouch, Bernard Bonhoure, Norbert Suard, Mikael Mabillean, Jonathan Vuillaume, Christelle Dulery, Didier Lapeyre, Celine Sauce	
<a href="#"><u><b>Centimeter Level Augmentation Service (CLAS) in Japanese Quasi-Zenith Satellite System, Design for Satellite Based RTK-PPP Services</b></u></a>	1958 - 1962
Masakazu Miya, Seigo Fujita, Yuki Sato, Koji Kaneko, Yoshihiro Shima, Rui Hirokawa, Hisao Sone, Jun-ichi Takiguchi	
<a href="#"><u><b>Comprehensive Comparison between Global Positioning System and BeiDou Navigation Satellite System in Terms of Satellite Data, Signals, and Measurements</b></u></a>	1963 - 1977
An-Lin Tao Student Paper Award - <i>Peer Reviewed</i>	

[Early PVT in Urban Environment with Operational and New Constellations](#)  
Bernard Bonhoure, T. Chapuis, T. Junique, F.X. Marmet, S. Rougerie, F. Lacoste, 1978 - 1991  
D. Lapeyre, P. Noirat

[Development of GLONASS Metrological Assurance Complex](#)  
Oleg Denisenko, Igor Silvestrov, Vyacheslav Fedotov, Anatoly Frolov, Dmitry 1992 - 1997  
Pecheritsa

## **D1: Next Generation Multisensor Applications and Techniques**

[A Computationally Efficient Platform for Inertial Sensor Calibration](#)  
James Balamuta, Roberto Molinari, Stephane Guerrier, Jan Skaloud - *Peer* 1998 - 2002  
*Reviewed*

[Automatic and Computationally Efficient Method for Model Selection in Inertial Sensor Calibration](#)  
Roberto Molinari, James Balamuta, Stéphane Guerrier, Xinyu Zhang, Jan Skaloud 2003 - 2006  
- *Peer Reviewed*

[A Novel Filtering Mechanism to Improve the Performance of GPS/MEMS Gyro Attitude Determination for NEO Satellite](#)  
Fuxiang Cao, Kay Soon Low, Keck Voon Ling, Eng Kee Poh, Chin Siong Lim, 2007 - 2012  
Guo Xiong Lee, Yung Fu Tsai - *Peer Reviewed*

[Dynamic Stochastic Modeling of Inertial Sensors for INS/GNSS Navigation](#)  
M. Wis, I. Colomina - *Peer Reviewed* 2013 - 2019

[Pilot-Assisted INS Aiding Using Bearing-Only Measurements Taken Over Time](#) 2020 - 2030  
Anthony T. Mirabile and Meir Pachter - *Peer Reviewed*

[Kalman Filter with Hard and Soft Constraints for the Integration of Multiple Pedestrian Navigation Systems](#)  
Haiyu Lan, Chunyang Yu, You Li, Yuan Zhuang and N. El-Sheimy - *BEST* 2031 - 2040  
*PAPER, - Peer Reviewed*

[ASSIST: An Advanced Snow Plough and Salt Spreader Based on Innovative Space Based Technologies](#) 2041 - 2054  
Antonio Defina, Alfredo Favenza, Gianluca Falco, Diego Orgiazzi, Marco Pini -  
*Peer Reviewed*

[Enhancing the Probability Models for Inference of Significant Activities Using a Real-time Learning Machine in Smartphone](#) 2055 - 2059  
Keqiang Liu, Ruizhi Chen and Tianxing Chu, Yunjia Wang - *Peer Reviewed*



## D2: Navigation Using Environmental Features

- [Smartphone-based Indoor Navigation Using PDR and Magnetic Matching](#) 2060 - 2066  
You Li, Xiaoji Niu, Peng Zhang, Haiyu Lan, Yuan Zhuang and N. El-Sheimy - *Peer Reviewed*
- [Line-Of-Sight Based Multipath Avoidance for GNSS Signals: Data Structures and Algorithms](#) 2067 - 2078  
Guoyu Fu, Lingjun Pu and Jyh-Charn Liu - *Peer Reviewed*
- [Multipath Assisted Positioning for Pedestrians](#) 2079 - 2086  
Christian Gentner, Robert Pöhlmann, Markus Ulmschneider, Thomas Jost, Armin Dammann - *BEST PAPER, - Peer Reviewed*
- [Stereo-inertial Odometry Using Nonlinear Optimization](#) 2087 - 2097  
Jianzhu Huai, Charles K. Toth and Dorota A. Grejner-Brzezinska - *Peer Reviewed*
- [Road Navigation Using Multiple Dissimilar Environmental Features to Bridge GNSS Outages](#) 2098 - 2114  
Debbie Walter, Paul D. Groves, Bob Mason, Joe Harrison, Joe Woodward, Paul Wright - *Peer Reviewed*
- [Adaptive Estimation of Altitude Bias in Terrain Referenced Navigation](#) 2115 - 2126  
Brian Copp and Kamesh Subbarao - *Peer Reviewed*
- [Tightly Coupled Stereo Vision Aided Inertial Navigation Using Continuously Tracked Features for Land Vehicles](#) 2127 - 2133  
Fei Liu, Yashar Balazadegan Sarvrood and Yang Gao - *Peer Reviewed*
- [Dynamic Fingerprint Positioning Method of Satellite Navigation Signal Based on 3-Dimensional Modeling Scene](#) 2134 - 2141  
Li Yang, Di He, Peilin Liu - *Peer Reviewed*
- [A Georeferencing Approach to Real-time Virtual Aid to Navigation Verification](#) 2142 - 2151  
R. Glen Wright, Michael Baldauf - *Peer Reviewed*
- [Loosely-Coupled Stereo Vision-Aided 3D Reduced Inertial Sensor and GPS for Land Vehicle Localization](#) 2152 - 2160  
Yashar Balazadegan Sarvrood and Yang Gao - *Peer Reviewed*

## D3: PANEL: GNSS Security and Robustness

- [u-blox - Locate, Communicate, Accelerate](#) 2161 - 2179  
Daniel Ammann
- [Trimble-Core GNSS - GNSS Security and Robustness](#) 2180 - 2207  
Stuart Riley

<a href="#"><u>Rockwell Collins Advanced Technology - RGNSS Security and Robustness: Civil Aviation</u></a>	2208 - 2216
Alex Stratton	
<a href="#"><u>Broadcom - Security and Robustness</u></a>	2217 - 2228
Frank van Diggelen	
<a href="#"><u>Schweitzer Engineering Laboratories, Inc. - GNSS Security and Robustness</u></a>	2229 - 2249
Shankar Achanta	
<a href="#"><u>Juniper Networks – GPS &amp; Precision Timing's Role in the Financial Services Sector</u></a>	2250 - 2266
Andrew F. Bach	

## **D4: Urban and Indoor Positioning and Navigation**

<a href="#"><u>DiPLoc: Direct Signal Domain Particle Filtering for Network Localization</u></a>	2267 - 2274
Siwei Zhang, Emanuel Staudinger, Wei Wang, Christian Gentner, Armin Dammann and Erik Sandgren - <i>BEST PAPER, - Peer Reviewed</i>	
<a href="#"><u>Enhanced State Estimation for Wheeled Vehicles</u></a>	2275 - 2281
Paul F. Roysdon, Jay A. Farrell, David Kelley - <i>Peer Reviewed</i>	
<a href="#"><u>An Adaptive Kalman Filter for a Range Measurement Based Indoor Positioning System: Algorithm Adaptation and Performance Testing</u></a>	2282 - 2290
Sihao Zhao, Yang Jiao, Haipeng Mi, Tianyi Ma, Mingquan Lu - <i>Peer Reviewed</i>	
<a href="#"><u>Indoor Localization Based on Floor Plans and Power Maps: Non-Line of Sight to Virtual Line of Sight</u></a>	2291 - 2300
Joe J. Khalifeh, Zaher M. Kassas, Samer S. Saab - <i>Peer Reviewed</i>	
<a href="#"><u>Graph-based Efficient WiFi Fingerprint Training Using Un-supervised Learning</u></a>	2301 - 2310
Bo Zhao, Ling Pei, Changqing Xu, Li Gu - <i>Peer Reviewed</i>	
<a href="#"><u>LiDAR-aided Integrated INS/GPS Navigation System for Unmanned Ground Vehicles in Urban and Indoor Environments Using Hybrid Adaptive Scan Matching Algorithm</u></a>	2311 - 2318
Shifei Liu, Mohamed M. Atia, Tashfeen B. Karamat, Aboelmagd Noureldin, Sidney Givigi - <i>Peer Reviewed</i>	
<a href="#"><u>Integrity Analysis in 3D LADAR Odometry</u></a>	2319 - 2328
Zhen Zhu, Maarten Uijt de Haag - <i>Peer Reviewed</i>	
<a href="#"><u>Multipath Assisted Positioning with Band-Limited Signals in an Urban Environment</u></a>	2329 - 2334
Markus Ulmschneider, Christian Gentner, Simon Ache, Andreas Roessler - <i>Peer Reviewed</i>	
<a href="#"><u>Wireless Positioning Approach Based on Stochastic Resonance</u></a>	2335 - 2342
Di He, Peilin Liu, Wenxian Yu - <i>Peer Reviewed</i>	

[Simultaneous Localization and Mapping of Emitting Radio Sources – SLAMERS](#) 2343 - 2354  
Chun Yang and Andrey Soloviev - *Peer Reviewed*

## **D5: Enhancing GNSS with Sensors, Mapping and Cooperation**

[Quasi-Tightly-Coupled GNSS-INS Integration with a GNSS Kalman Filter](#) 2355 - 2361  
Bruno Scherzinger - *Peer Reviewed*

[Optimal Receiver Placement for Collaborative Mapping of Signals of Opportunity](#) 2362 - 2368  
Joshua J. Morales and Zaher M. Kassas - *BEST PAPER, - Peer Reviewed*

[Seamless Handover of Satellite Tracking Using Geographic Aiding](#) 2369 - 2379  
Okuary Osechas, Kyeong Jin Kim, Kieran Parsons - *Peer Reviewed*

[UWB for Navigation in GNSS Compromised Environments](#) 2380 - 2389  
Kai Dierenbach, Steve Ostrowski, Grzegorz Jozkow, Charles K. Toth, Dorota A. Grejner-Brzezinska, Zoltan Koppanyi - *Peer Reviewed*

[NLOS Exclusion using Consistency Check and City Building Model in Deep Urban Canyons](#) 2390 - 2396  
Li-Ta Hsu and Shunsuke Kamijo - *Peer Reviewed*

[Enhancing Conventional GNSS Positioning with 3D Mapping without Accurate Prior Knowledge](#) 2397 - 2409  
Mounir Adjrad and Paul D. Groves - *Peer Reviewed*

[Robust GNSS Navigation in Urban Environments by Bounding NLOS Bias of GNSS Pseudoranges Using a 3D City Model](#) 2410 - 2420  
N. Kbayer, M. Sahmoudi and E. Chaumette - *Peer Reviewed*

[GNSS Shadow Matching: The Challenges Ahead](#) 2421 - 2443  
Paul D. Groves, Lei Wang, Mounir Adjrad, Claire Ellul - *Peer Reviewed*

[Distributed GNSS Collaborative Localization: Theoretical Performance Analysis and Simulation Verification](#) 2444 - 2454  
Bin Huang, Zheng Yao, Xiaowei Cui, Mingquan Lu, Jing Guo - *Peer Reviewed*

## **D6: Smartphone Applications and Multisensor Navigation**

[MyGeoTrust: A Platform for Trusted Crowdsourced Geospatial Data](#) 2455 - 2469  
R.E. Guinness, H. Kuusniemi, J. Vallet, T. Sarjakoski, J. Oksanen, M. Islam, M. Syeed, H-M. Halkosaari, P. Kettunen, M. Laakso, M. Rönneberg - *Peer Reviewed*

[GNSS Photo Matching: Positioning using GNSS and Camera in Urban](#) 2470 - 2480

## Canyon

Taro Suzuki, Nobuaki Kubo - *BEST PAPER, - Peer Reviewed*

## The Development of Constraint Algorithms and Real-time Smoothing for Pedestrian Indoor Navigation with Smartphones

Jhen-Kai Liao, Kai-Wei Chiang, Zhi-Ming Zhou, Guang-Je Tsai - *Peer Reviewed* 2481 - 2492

## A Robust Context-based Heading Estimation Algorithm for Pedestrian Using a Smartphone

Lin Wang, Zhenjiang Dong, Ling Pei, Jiuchao Qian, Chengxuan Liu, Donghui Liu, Peilin Liu - *Peer Reviewed* 2493 - 2500

## Development of a Diagnostic Tool for Cognitive Impairment using a Smart Navigation Device

Shu-Hua Tsao, Shau-Shiun Jan, Ming-Chyi Pai, Ling-Hui Chang, Yung-Hsiang Cheng and Chun-Yu Lin - *Peer Reviewed* 2501 - 2510

## Contextual Thinking for Inference and Prediction of Daily Activities by Mining Smartphone Data

Tianxing Chu, Ruizhi Chen, Keqiang Liu, Jingbin Liu, and Yuwei Chen - *Peer Reviewed* 2511 - 2517

## On software Architecture Concepts for a Unified, Generic and Extensible Trajectory Determination System

M. Eulalia Parés, Ismael Colomina - *Peer Reviewed* 2518 - 2526

## A Multi-information Fusion Positioning Method Based on GPS/BDS/visual/WLAN/barometric

Lai Qifeng, Wei Dongyan, Zhang Xiaoguang - *Peer Reviewed* 2527 - 2536

# **E1: Advanced Technologies in High Precision GNSS Positioning 1**

## Relative Positioning Using RTK Measurement Filtering and PPP

G. Seepersad, J. Aggrey, M. Gill, and S. Bisnath, D. Kim, H. Tang - *Peer Reviewed* 2537 - 2547

## Aided GPS Integer Ambiguity Resolution Using Low-cost Motion Sensors

Tashfeen B. Karamat, Mohamed M. Atia, Malek Karaim, Aboelmagd Noureldin - *Peer Reviewed* 2548 - 2559

## Integration of Inertial Navigation into Real-Time GIPSY-x (RTGx)

Jason N. Gross, Ryan M. Watson and Victor Sivaneri, Yoaz E. Bar-Sever, William I. Bertiger, Bruce Haines - *Peer Reviewed* 2560 - 2569

## Low-Cost Precise Positioning Using a National GNSS Network

Martti Kirkko-Jaakkola, Stefan Söderholm, Salomon Honkala, Hannu Koivula, 2570 - 2577

Sonja Nyberg, and Heidi Kuusniemi - *Peer Reviewed*

[Improved PPP Ambiguity Resolution by a Cascaded Method of Separating Orbit Errors from Satellite FCBs](#) 2578 - 2594

Yihe Li Student Paper Award - *Peer Reviewed*

[Triple-frequency BDS and Dual-frequency GPS Combination RTK Algorithm for Moving Baseline Relative Positioning](#) 2595 - 2604

Sihao Zhao, Feng Guan, Xiaowei Cui, Zheng Yao, Mingquan Lu - *Peer Reviewed*

[Compressive Sensing Approach for the Anomalous Measurements Detection. Experimental and Comparison Results](#) 2605 - 2615

Lev Rapoport - *Peer Reviewed*

[Fault Free Integrity of Mid-Level Voting for Triplex Differential GPS Solutions](#)

G. Nathan Green, Martin King, Todd Humphreys - *BEST PAPER, - Peer Reviewed* 2616 - 2624

## **E2a: Next Generation GNSS Positioning**

[Application of a Fast Unscented Kalman Filtering Method to Satellite Position Estimation using a Space-borne Multi-GNSS Receiver](#) 2625 - 2631

Sanat Biswas, Li Qiao, Mazher Choudhury, Andrew Dempster - *Peer Reviewed*

[magicGNSS' RTCM-based Service, a Leap Forward Towards Multi-GNSS High Accuracy Real-Time Processing](#) 2632 - 2642

G. Tobías, J.D. Calle, A.J. García, D. Luque, I. Rodríguez - *Peer Reviewed*

[Single-frequency L5 PPP-RTK with GPS, IRNSS, QZSS and Galileo](#) 2643 - 2653

W. Li, N. Nadarajah, P.J.G. Teunissen, A. Khodabandeh - *Peer Reviewed*

[Different Positioning Strategies Using Multi-Frequency / Multi-Constellation GNSS Measurements](#) 2654 - 2668

M. Stanisak, U. Haak, A. Schwithal - *Peer Reviewed*

[Characterization of GNSS Frequency Diversity for Pseudorange Accuracy Enhancement in Fading Environments](#) 2669 - 2680

Ranjeeth Kumar Siddakatte, Ali Broumandan, Gérard Lachapelle - *Peer Reviewed*

[A New Approach for GNSS Frequency Selection Considering Detection of Cycle Slip Insensitive Pairs of Ionospheric Combination for Dual-Frequency Receivers](#) 2681 - 2687

Junesol Song and Changdon Kee - *Peer Reviewed*

[Multi-Constellation ARAIM Exploiting Satellite Geometry Change](#) 2688 - 2704

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<a href="#"><u><b>Performance Analysis of Combined GPS, GLONASS and BeiDou RTK Based on Single Differenced Observations between Receivers</b></u></a>	2753 - 2765
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<a href="#"><u><b>Dual-polarization GNSS Observations for Multipath Mitigation and Better High-precision Positioning</b></u></a>	2772 - 2779
K. Palamartchouk, P.J. Clarke, S.J. Edwards, R. Tiwari - <i>Peer Reviewed</i>	
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<a href="#"><u><b>Advanced GNSS Algorithms and Services Based on Highly-stable On-board Clocks</b></u></a>	2801 - 2808
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<a href="#"><u><b>Fast and Reliable GNSS Attitude Estimation Using a Constrained Bayesian Ambiguity Resolution Technique (C-BART)</b></u></a>	2809 - 2820
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[New Approach for Integrity Bounds Computation Applied to Advanced Precise Positioning Applications](#)  
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[The Effect of Correlator and Front-End Design on GNSS Pseudorange Biases for Geodetic Receivers](#) 2835 - 2844  
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[Examining the Interoperability of PPP-AR Products](#) 2845 - 2857  
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[Precise Positioning and L2C Signal Reception for the Mass Market](#)  
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[Benefits of Chip Scale Atomic Clocks in GNSS Applications](#) 2867 - 2874  
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[An Analytical Method to Determine Squaring Loss and Weak Signal Post Correlation SNR for a Broad Class of GNSS Signals](#) 2875 - 2886  
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[Performance Comparison of Difference Correlator and Co-op Tracking Architectures Under Receiver Clock Instability](#) 2887 - 2904  
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[A Unique Approach to Strong Multipath Mitigation in Dense Urban Areas](#) 2905 - 2913  
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[Computing Meaningful Integrity Bounds of a Low-cost Kalman-filtered Navigation Solution in Urban Environments](#)  
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[Signal-level Integrity and Metrics Based on the Application of Quickest Detection Theory to Multipath Detection](#)  
D. Egea-Roca, G. Seco-Granados, J.A. López-Salcedo, C. Moriana, M.J. Pasnikowski, E. Domínguez, E. Aguado, D. Lowe, D. Naberzhnykh, F. DAVIS, I. Fernández-Hernández, J.P. Boyero - *BEST PAPER, - Peer Reviewed* 2926 - 2938

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- A. Hornbostel and A. Konovaltsev, P-Y. Dumas - *Peer Reviewed*
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