

International Symposium on GPS/GNSS 2008

**Odaiba, Tokyo, Japan
11-14 November 2008**

Volume 2 of 3

ISBN: 978-1-61567-649-1

Comparisons of Error Characteristics between TOA and TDOA in Presence of Range Bias Errors: Ji-Hee Park, *Korea*, Ji-Won Park, Tae-Kyung Sung, *Chungnam National University, Korea*, Jee-Hwan Ahn, *Electronics and Telecommunications Research Institute, Korea* ----- **494**

Development of an FLAOA Location Method for Indoor Mobile Robots: Ji-Won Park, Hyun-Ja Im, Tae-Kyung Sung, *Chungnam National University of Korea, Korea*, Sung-Ho Lee, *LIGNex1, Korea* -- **500**

Development of Seamless Location Based Service and System based on IMES: Takamasa Kawaguchi, Shinya Yoshihara, Tomoichi Ebata, Yoko Morii, *Hitachi Ltd., System Development Lab., Japan*, Yutaka Shimogaki, *Hitachi Ltd., Information & Telecommunication Systems* ----- **505**

Indoor GPS receiver for mobile robot navigation: Haruhiko Niwa, Kenri Kodaka, Yoshihiro Sakamoto, and Shigeki Sugano, *Waseda University, WABOT-HOUSE Laboratory, Japan*, Takuji Ebinuma, *Tokyo University of Marine Science and Technology, Japan* ----- **511**

Development of Assisted GNSS for Seamless Positioning Using IEEE 802.15.4a Data-link: Yong-Soo Kim, Gyu-In Jee, *Department of Electronics Engineering, Konkuk University, Korea*, Chan-Gook Park, *Department of Mechanical and Aerospace Engineering, Seoul National University, Korea*
----- 517

Low-cost GPS Pseudolite: Hongliang Xu, Chuanrun Zhai, Xin Zhang, Yanhua Zhang, Xingqun Zhan, *Institute of Aerospace Science & Technology, Shanghai Jiao Tong University, China* ----- 521

Novel Time-Sharing Scheme for Virtual Elimination of Locata-WiFi Interference Effects: Faisal A. Khan, Chris Rizos, Andrew G. Dempster, *University of New South Wales, Australia* ----- 526

Pedestrian Navigation System with Fall Detection and Energy Expenditure Calculation for the Elderly: Deok Hee Han, Chansik Park, En Jong Cha, *Chungbuk National University, Korea*, Sang Jeong Lee, *Chungnam National University, Daejeon, Korea* ----- 531

Performance Evaluation of a Singularity-free Positioning Algorithm in 3D WSN: Seung Beom Kim, *Chungnam National University, Korea*, Chansik Park, *Chungbuk National University, Korea*, Sang Jeong Lee, *Chungnam National University, Korea* ----- 538

Three Dimensional Positioning System Using a Single Pseudolite: Hironori Kawano, Minoru Kawano, *Radio Communication Systems Ltd., Japan*, Yasunori Takeuchi, *Chugoku Electric Power Co., Inc, Japan*
----- 544

12. Novel Applications

A Marine Information Management System Utilizing Ship LAN: Yi Sun, Chunming Fan, Kimihiko Ueno, Masao Nemoto, *Tokyo University of Marine Science and Technology, Japan*, Zhixing Liu, *National Institute of Informatics, Japan*, Akio Yasuda, *Tokyo University of Marine Science and Technol, Japan*
----- 548

Entrepreneurship: A Highway from University to the Market: Getulio K. Akabane, Odair Farias, *Catholic University of Santos PPGN, Brazil* ----- 552

How hybrid GPS-based surveying techniques can further assist with structural design and construction: Xiaojing Li, *University of New South Wales, Australia* Akihito Yoshida, Yukio Tamura, *Tokyo Polytechnic University, Japan* Chris Rizos, Linlin Ge, *University of New South Wales, Australia*, Ryuji Imai, *Urban Renaissance Agency, Japan* ----- **553**

Validations of GNSS Radio Occultation Technique over Australia: Kefei Zhang, Falin Wu and Erjiang Fu, *RMIT University, Australia*, Xiao Xu, *Wuhan University, China*, Anthony Rea, Gary Weymouth, Bertukan Biadeglne, Yuriy Kuleshov, *Australian Bureau of Meteorology, Australia* ---- **563**

13. Positioning Trends & New Technologies

An Empirical Approach to Study the Effects of A Priori Observations Sigma Ratio in Single Frequency Precise Point Positioning: Sue Lynn Choy, Kefei Zhang, David Silcock, Lucas Holden, *RMIT University, Australia* ----- **572**

Certification of RF Simulator Performance for System and Application Testing: John Pottle, Darren Fisher, Stuart Smith, *Spirent Communications plc, United Kingdom* ----- **584**

Development of Ultimate Seamless Positioning System for Global Cellular Phone Platform based on QZSS IMES: Dinesh Manandhar, Kazuki Okano, Makoto Ishii, Masahiro Asako, Hideyuki Torimoto, GNSS Technologies Inc., Japan, Satoshi Kogure, *Japan Aerospace Exploration Agency (JAXA), Japan*, Hiroaki Maeda, *Lighthouse Technology and Consulting, Japan* ----- **585**

Grey Relational Analysis-Aided H_{∞} Filtering for GPS Navigation: Dah-Jing Jwo, Hsin-Hsu Lin, *National Taiwan Ocean University, Taiwan* ----- **590**

Performance Evaluation and Test Results of a Single-Frequency Mass Market GNSS Receiver: M. Ammann, A. Somieski, *u-blox AG, Switzerland* ----- **600**

Signal Definition of QZSS IMES and its Analysis: Dinesh Manandhar, Kazuki Okano, Makoto Ishii, Masahiro Asako, Hideyuki Torimoto, *GNSS Technologies Inc., Japan*, Satoshi Kogure, *Japan Aerospace Exploration Agency (JAXA), Japan*, Hiroaki Maeda, *Lighthouse Technology and Consulting, Japan* - **609**

Ultra Wideband –Based Indoor Positioning System: Wang Jin, Lu xiaochun, *National Time Service Center, the Chinese Academy of Sciences, China* ----- 614

14. Precise Timing

A Precision Time Transfer Scheme Using the Maritime DGPS Signal: Ik Jun Choi, Mi Young Shin, Sang Jeong Lee, *Chungnam National University, Korea*, Sung-Hun Yang, Chang-Bok Lee, *Korea Research Institute of Standards and Science, Korea*, Chansik Park, *Chungbuk National University, Korea* ----- 620

Current status of time management system of QZSS: Shin'ichi Hama, Yasuhiro Takahashi, Jun Amagai, Miho Fujieda, *National Institute of Information and Communications Technology (NICT), Japan* ----- 625

Development Status of Software T&F Receiver for GNSS Common Views: Ryuei Yamada, Fujinobu Takahashi, Yuki Ito, Shota Ishikawa, Takuya Shinno, *Yokohama National University, Japan* ----- 631

Effects of ionospheric delay correction on 1PPS accuracy improvement by using L1C/A and L2C: Naomi Fujisawa, Hiraku Nakamura, Yoji Goto, Katsuo Yamada, Hitoshi Kondo, *Furuno Electric Co., Ltd., Japan* ----- 634

Evaluation of Timing Performance by GGTO Depending on Number of Unknown Parameters: Mi Young Shin, Sang Jeong Lee, *Chungnam National University, Korea*, Sung-Hoon Yang, Chang-Bok Lee, Seung-Woo Lee, Young-Kyu Lee, *Korea Research Institute of Standards and Science, Korea*, Dong-Hui Yu, *Catholic University of Pusan, Korea*, Gabriele Mocci, *Telespazio, Italy* ----- 640

Generation of Measurement Data Set for the GGTO simulation: Sung-Hoon Yang, Chang-Bok Lee, Seung-Woo Lee, Young-Kyu Lee, *Korea Research Institute of Standards and Science, Korea*, Sang-Jeong Lee, *Chungnam National University, Korea*, Dong-Hui Yu, *Catholic University of Pusan*, Gabriele Mocci, *Telespazio, Italy* ----- 646

Ground Station Control for Remote Synchronization of Onboard Crystal Oscillators of Quasi-Zenith Satellites: Toshiaki Iwata, Takashi Matsuzawa, Yuji Hashibe, Satoshi Fukushima, *National Institute of Advanced Industrial Science and Technology (AIST), Japan*, Masato Fukui, *University of Tokyo, Japan*, Yasuhiro Takahashi, Miho Fujieda, *National Institute of Information and Communications Technology (NICT), Japan*, Satoshi Kogure, Hidemi Hase, *Japan Aerospace Exploration Agency (JAXA), Japan* ----- 651

Integrated Monitoring System of Space-born Clocks at KRISS: Chang-Bok Lee, Sung-Hoon Yang, Young-Kyu Lee, Seung-Woo Lee, Yong-Hyun Kim, *Korea Research Institute of Standards and Science, Korea* ----- 658

Precise Time Transfer and Ranging Experiment Result between Ground and ETS-VIII: Yasuhiro Takahashi, Fumimaru Nakagawa, Hiroo Kunimori, Jun Amagai, Shigeru Tsuchiya, Ryo Tabuchi, Shin'ichi Hama, *National Institute of Information and Communications Technology, Japan*, Hiroyuki Noda, *Japan Aerospace Exploration Agency, Japan* ----- 659

15. Receiver Design and Signal Processing

A Self-adaptive Code Tracking Loop Design for Galileo BOC(1,1) Signal: Dongkai. Yang, Weiqiang. Li, Qishan. Zhang, *Beihang University, China* ----- 664

Algorithm of the IF Signal Generation in the Software-Based IF GNSS Signal Simulator: Tae-Hee Kim, Jae-Eun Lee, Sanguk Lee, Jae-Hoon Kim, *Satellite Ground Control Research Team, ETRI, Korea* ----- 669

Analysis of Land and Sea Reflected GPS Signal: Dinesh Manandhar, Ryosuke Shibasaki, *Centre for Spatial Information Science, The University of Tokyo, Japan* ----- 675

Architecture and Benefits of an Advanced GNSS Software Receiver: Mark G. Petovello, Cillian O'Driscoll, Gérard Lachapelle, Daniele Borio, Hasan Murtaza, *Position, Location and Navigation (PLAN) Group, University of Calgary, Canada* ----- 681

Cross-correlation Performance Comparison of L1 & L2C GPS Codes for Weak Signal Acquisition: Sana Ullah Qaisar ¹ and Andrew G. Dempster, <i>The University of New South Wales, Australia</i> -----	692
Digital combining technique for processing multiple GPS antennas signals: Il Kyu Park, Seok Bo Son, Se Hwan Kim, Young Baek Kim, <i>Hanyang Navicom R&D Center, Korea</i> , Sang Jeong Lee, <i>Chungnam National University, Korea</i> -----	701
Efficient Algorithms for Improving the Performance of Weak Signal Acquisition on the Real-Time Software GNSS Receiver: Sung-Hyuck Im, Gyu-In Jee, <i>Department of Electronics Engineering, Konkuk University, Korea</i> -----	706
GIOVE-B E1-B Signal Processing Assisted E1-C Range Code Only: Byung-Hyun Lee, Gyu-In Jee, <i>Konkuk University, Korea</i> -----	711
GNSS/Pseudolite Signal Re-Acquisition with the aid of INS in Short Signal Blockage Scenarios: Peng Li, Jinling Wang, <i>The School of Surveying and Spatial Information Systems, The University of New South Wales, Australia</i> , Zhenming Feng, <i>The Department of Electronic Engineering, Tsinghua University, China</i> -----	716
GPS Receiver with Enhanced User Positioning Time: Seung-Hyun Yoon, Ji-Woon Jung, Su-Bong Kim, Hyun-Chang Shin, Jae-Hyang Lee, Kyu-Yun Lee, and Hyo-Sun Shim, <i>Digital Media R&D Center, Samsung Electronics, Korea</i> -----	722
Implementation of FPGA-Based Acquisition of Weak GPS Signals: Jun Xu, Xuchu Mao, <i>Department of Instrument Science & Engineering, Shanghai Jiao Tong University, China</i> -----	727
Vector Tracking Loop based GPS/INS Deep Integration using Combined Kalman Filter: Jong-Hwa Song, Kwang-Hoon Kim, Gyu-In Jee, <i>Department of Electronic Engineering, Konkuk University, Korea</i> -----	732

Performance analysis of a Galileo E1 weak signal acquisition algorithm: Soon Lim, Deok Won Lim, Dong-Hwan Hwang, Sang Jeong Lee, *Department of Electronics Engineering, Chungnam National University, Korea*, Seung Wook Moon, *Hanyang Navicom Co. Ltd, Korea*, Chansik Park, *School of Electrical and Computer Engineering, Chungbuk National University, Korea* -----736

Performance Analysis of Composite PRN Code Acquisition Methods for GNSS Signal: Li-Ta Hsu, Chih-Cheng Sun, Shau-Shiun Jan, *Department of Aeronautics and Astronautics, National Cheng Kung University, Taiwan* -----741

Performance Analysis of the GIOVE-B/CBOC Signal: Masatoshi Matsumoto, Katsuo Yamada, *Furuno Electric Co., Ltd., Japan* -----749

Performance Evaluation of Tracking Loops in a Galileo BOC (1, 1) Receiver: Deok Won Lim, Sung Lyong Cho, Soon Lim, Dong-Hwan Hwang, Sang Jeong Lee, *Department of Electronics Engineering, Chungnam National University, Korea*, Seung Wook Moon, *Hanyang Navicom Co.Ltd, Korea*, Chansik Park, *School of Electrical and Computer Engineering, Chungbuk National University, Korea* -----757

Rotation Demodulation Method of GNSS Receivers for Spinning Vehicles: Hee Won Kang, Liu Meilin, *Department of Electronics Engineering, Chungnam National University, Korea*, Jeong Won Kim, *Korea Aerospace Research Institute, Korea*, Dong-Hwan Hwang, Sang Jeong Lee, *Department of Electronics Engineering, Chungnam National University, Korea* -----762

Acquisition Scheme for a High Sensitivity Assisted GPS Receiver Considering Apply Scenarios: Zhixing Liu, *National Institute of Informatics, Japan*, Chunming Fan, *Tokyo University of Marine Science and Technology, Japan*, Shoichiro Asano, *National Institute of Informatics, Japan*, Kimihiko Ueno, Masao Nemoto, Akio Yasuda, *Tokyo University of Marine Science and Technology, Japan* ----767

The Vector Tracking Loop Design based on the Extended Kalman Filter: Kwang-Hoon Kim, Jong-Hwa Song, Gyu-In Jee, *Department of Electronic Engineering, Konkuk University, Korea* -----773

Two Signal Processing Algorithms Used in Galileo E1 Receiver: Yun Qiao, Shinji Oda, Tadimitsu Hirai, Harumi Mizuno, Koichi Washizu, *Japan Radio Co., Ltd., Japan* -----781

USB2.0 Based GPS Software Receiver: Implementation and Some Initial Results: Zhe He, Chuanrun Zhai, Yanhua Zhang, Xingqun Zhan, *Institute of Aerospace Science and Technology, Shanghai Jiao Tong University, China* ----- 786

Weak GPS Signal Tracking Using Square Root Filter Algorithm: Guangyu Zhou, Xuchu Mao, *Department of Instrument Science & Engineering Shanghai Jiao Tong University, China* ----- 792

16. RTK-GPS and ambiguity resolution

A Search and Shrink Approach for the Baseline Constrained LAMBDA Method: Experimental Results: G. Giorgi, P.J.G. Teunissen, P.J. Buist, *Delft University of Technology, The Netherland* ----- 797

A Simple Sequential Method for Integer Ambiguity Resolution in Real-Time GNSS Positioning: Shaocheng Zhang *School of Geodesy and Geomatics, Wuhan University, China*, Samsung Lim and Chris Rizos, *School of Surveying and Spatial Information Systems, University of New South Wales, Australia* -
----- 807

A Study on Improvement of Positioning Accuracy for GPS L1 Users using GPS Network: Byung K. Choi, Jong U. Park, Sung K. Cho, *Korea Astronomy and Space Science Institute, Korea*, Sang J. Lee, *Chung-Nam National University, Korea* ----- 815

Accuracy Assessment of GPS Kinematic Positioning based on Densified Observables: C. C. Chang, *Ching-Yun University, Korea*, H. Y. Lee, *Jet-Link Technology Inc., Korea* ----- 819

An Investigation of Performance Difference of Regional Atmospheric Models for Network RTK - A Case Study in Victoria: Suqin Wu, Kefei Zhang, David Silcock, *RMIT University, Australia* ----- 828

Comparison of Accuracy of the RTK Solution and Initialization Time with Fixed and Roving Antenna: Tatsunori Sada, *College of Science and Technology, Nihon University, Japan*, Shigeyuki Murayama, *Techno Vanguard, Japan* ----- 838

Development of a new tsunami monitoring system using a GPS buoy: Teruyuki Kato, *Earthquake Research Institute, the University of Tokyo, Japan*, Yukihiro Terada, *Kochi National College of Technology, Japan*, Toshihiko Nagai, Katsuyoshi Shimizu, Takashi Tomita, *Port and Airport Research Institute, Japan*, Shun'ichi Koshimura, *Graduate School of Engineering, Tohoku University, Japan* -- **846**

Evaluation of RTK-GPS Performance with Low-cost Single-frequency GPS Receivers: Tomoji Takasu, Akio Yasuda, *Tokyo University of Marine Science and Technology, Japan* ----- **852**

Instantaneous Multi-Baseline Ambiguity Resolution with Constraints: P.J. Buist, P.J.G. Teunissen, G. Giorgi, S. Verhagen, *Delft University of Technology, The Netherlands* ----- **862**

Instantaneous RTK Positioning Based on User Velocity Measurements: Nobuaki Kubo, *Tokyo University of Marine Science and Technology, Japan* ----- **872**

Network-RTK GPS Positioning in Japan: Yohta Kumaki, *Promotion Council of Real Time Positioning Using GPS-based Control Stations, Japan / Senshu University, Japan* ----- **882**

New Method for Graphically Representing Residual Error in an RTK Network in Real Time: Neil Brown, Paul Alves, *Leica Geosystems, Switzerland*, ----- **885**

Performance evaluation of precise positioning with HD video camera and image processing: He Jiang, Tomoji Takasu, Akio Yasuda, Takuji Ebinuma, *Tokyo University of Marine Science and Technology, Japan* ----- **892**

Double Differencing Position Domain Hatch Filter Generating Robust Float Solutions For Short-Baseline RTK: H. S. Kim, H. K. Lee, *Korea Aerospace University, Korea* ----- **898**

Statistical property of the GNSS carrier phase observations and the related hypothesis testing with the bootstrap methods: Jianqing Cai, *Institute of Geodesy, Stuttgart University, Germany*, Congwei Hu *Dept. of Surveying and Geo-Informatics, Tongji University, China*, Erik Grafarend, *Institute of Geodesy, Stuttgart University, Germany* ----- **903**

17. Signal Interference and Multipath

A Novel Beamforming Architecture with Software GNSS Receiver Implementation: Min Li, *National University of Defense Technology / University of New South Wales, Australia*, Feixue Wang, *National University of Defense Technology, China*, Asghar Tabatabaei Balaei, Andrew G. Dempster, Chris Rizos, *University of New South Wales, Australia* ----- **904**

Analysing the Effectiveness of Wavelet Transform for Mitigating C/A Code Multipath at GPS Reference Stations: Thilantha L. Dammalage, *School of Engineering and Technology, Asian Institute of Technology, Thailand*, Chalermchon Satirapod, *Department of Survey Engineering, Faculty of Engineering, Chulalongkorn University, Thailand*, Seishiro Kibe, *School of Engineering and Technology, Asian Institute of Technology, Thailand* ----- **910**

Analysis of the effect of channel-mismatch for GPS anti-jamming algorithms: Sang Wook Hwang, Sung Lyong Cho, Geon Woo Lee, Dong-Hwan Hwang, Sang Jeong Lee, *Department of Electronics Engineering, Chungnam National University, Korea*, Chang Won Lee, *Agency for Defense Development, Korea*, Chansik Park, *School of Electrical and Computer Engineering, Chungbuk National University, Korea* ----- **919**

Design of a TOA-based Anti-Spoofing Method for GPS Civil Signal: Sung Lyong Cho, Mi Young Shin, Soon Lim, Dong-Hwan Hwang, Sang Jeong Lee, *Department of Electronics Engineering, Chungnam National University, Korea*, Chansik Park, *School of Electrical and Computer Engineering, Chungbuk National University, Korea* ----- **925**

Detection, Identification And Mitigation of Outliers in Receiver Autonomous Integrity Monitoring (RAIM) by Solving Observation Equations: Hiroshi Isshiki, *School of Naval Architecture and Ocean Engineering, University of Ulsan, Korea* ----- **932**

Differential Early Late Phase for Multipath Detection at Critical Doppler Offsets: Omer Mohsin Mubarak, Andrew G Dempster, *The University of New South Wales, Australia* ----- **939**

Ionospheric disturbances observed by the PALSAR onboard ALOS satellite: Masanobu Shimada, *Earth Observation Research Center, Japan Aerospace Exploration Agency, Japan*, Yasushi Muraki, *Department of Physics, Konan University, Japan*, Yuichi Otsuka, *Solar-Terrestrial Environment Laboratory, Nagoya University, Toyokawa, Japan* -----947

Modified High Resolution Correlator Scheme for Improving the Performance of Short Delay Multipath Mitigation: Hyoungmin So, Ghangho Kim, Taikjin Lee, Sanghoon Jeon, S Changdon Kee, *eoul National University, Korea* -----953

Multipath Mitigation Performance Comparison of Strobe Correlators in GNSS Receivers: Jinghui Wu, Andrew G Dempster, *The School of Surveying and Spatial Information Systems, University of New South Wales, Australia* -----963

On GPS Signal Multipath Modeling for Environments with Mobility: Slobodan Nedic, *Nedics Associates, USA* -----973

Phase calibration and attitude determination of a 2 by 2 phased arrayGNSS antenna: Asghar Tabatabaei Balaei, *University of New South Wales, Australia*, Min Li, *University of Defense Technology, China*, Andrew G. Dempster, *University of New South Wales, Australia* -----983

Tests with Practical Multivariate Statistical Multipath Detection Methods Using Multiple-Frequency GNSS Phase Data: Lawrence Lau, Paul Cross, *Department of Civil, Environmental and Geomatic Engineering, University of College London, United Kingdom* -----990

18. Space Based & Ground Based Augmentation

Study of Applying Data Mining Approach to Detect Anomalous Event for GBAS: Kazushi Suzuki, Takayuki Kaneso, Takeshi Ono, *NEC Corporation, ATC/NAV Systems Department, Japan*, Takayuki Nakata, Kenji Aoki, *NEC Corporation, Data Mining Research Group, Common Platform Software Research Lab., Japan* -----1005

A Study on the Error Modeling of Differential GPS Correction: Jin-Kyu Choi, Sang-Hyun Park, Deuk-Jae Cho, Won-Seok Jang, Sang-Hyun Suh, *GNSS Research Center, Maritime and Ocean Engineering Research Institute, Korea Ocean Research and Development Institute, Korea* ----- 1014