Contents

Part I Satellite Navigation Signals and Signal Processing

Research on Communication Delay Model for Narrow Beam Inter-satellite Links in a TDMA System ........................................ 3
Daoning Yang, Ying Liu, Gang Li, Jun Yang, Qian Zhao and Zhixi Yang

Satellite-Induced Multipath Analysis on the Cause of BeiDou Code Pseudorange Bias ......................................................... 11
Hailong Xu, Xiaowei Cui and Mingquan Lu

Single Receiver Against Repeater Deception Jamming Technology Research ................................................................. 23
Ke Liu, Wenqi Wu, Kanghua Tang, Shihao Zhang and Zhijia Wu

The Effect of Cross-Correlation Items on the Intersystem Interference Between GPS, BDS and Galileo ............................... 37
Bingxue Chen, Xufang Huang, Xuyang Wang and Tangchao Li

An Improved High-Sensitivity Acquisition Algorithm for BDS B2 Signal ............................................................. 57
Xue Wang, Jianchao Du and Weibin Li

An Implementation of Navigation Message Authentication with Reserved Bits for Civil BDS Anti-Spoofing ....................... 69
Muzi Yuan, Zhicheng Lv, Huaming Chen, Jingyuan Li and Gang Ou

Performance Analysis of Signal Diversity Reception for Large Aperture Array in Beidou RDSS System ........................ 81
Haodong Jiang, Jingyuan Li, Xiangwei Zhu and Gang Ou

Study on Multipath Model of BDS/GPS Signal in Urban Canyon .... 95
Yuze Wang, Xin Chen, Peilin Liu and Wenxian Yu
Part II Satellite Navigation Augmentation Technology

An Efficient Algorithm for Determining the Correspondence Between DFREI and $\sigma_{DFRE}$ for a Dual-Frequency Multi-constellation Satellite-Based Augmentation System .......................... 109
Jie Chen, Zhigang Huang, Rui Li and Weiguang Gao

Analysis on Ionospheric Delay Variogram Modeling in China ............... 119
Dun Liu, Xiao Yu, Liang Chen and Weimin Zhen

Scintillation Modeling and Its Application in GNSS .......................... 131
Dun Liu, Xiao Yu, Jian Feng and Weimin Zhen

A New Algorithm for Receiver Integrity Monitoring with Receiver Clock Error Auxiliary ........................................ 145
Ye Ren, Xiaohui Li and Longxia Xu

FTS-Based Link Assignment and Routing in GNSS Constellation Network ........................................ 155
Tian-yu Zhang, Gang-qiang Ye, Jing Li and Jing-wen Xu

Construction and Performance Analysis of GPS/Beidou/Galileo Real-Time Augmentation System .......................... 167
Liang Chen, Ying Liu, Changjiang Geng, Maorong Ge and Jiao Wenhai

An Improved Algorithm of Ionospheric Grid Correction Based on GPS and Compass Multi-constellation .......................... 183
Haipeng Li, Rui Li, Ziqi Wang and Weiguang Gao

A Study on Construction of Ionospheric Spatial Threat Model for China SBAS ........................................ 195
Dun Liu, Jian Feng, Li Chen and Weimin Zhen

RAIM Algorithm Based on Robust Extended Kalman Particle Filter and Smoothed Residual ........................................ 209
Zhen Li, Dan Song, Fei Niu and Chengdong Xu

Research on RAIM Algorithm Based on GPS/BDS Integrated Navigation ........................................ 221
Fuxia Yang, Ershen Wang, Tao Pang, Pingping Qu and Zhixian Zhang

RAIM Algorithm Based on Residual Separation ........................................ 233
Zhaoyang Li, Qingsong Li and Jie Wu

BDS Code Bias and Its Effect on Wide Area Differential Service Performance ........................................ 245
Sainan Yang, Junping Chen, Yize Zhang, Chengpan Tang, Yueling Cao, Qian Chen and Wei Chen
Ionospheric STEC and VTEC Constraints for Fast PPP .......................... 257
Yan Xiang, Yang Gao and Yihe Li

Initial Assessment of BDS Zone Correction ................................. 271
Yize Zhang, Junping Chen, Sainan Yang and Qian Chen

Part III Multi-source Fusion Navigation Technology

Test Results of HiSGR: A Novel GNSS/INS Ultra Tight Coupled Spaceborne Receiver ..................................................... 285
Xiaoliang Wang, Deren Gong, Yanguang Wang, Bo Qu, Longlong Li, Xingyuan Han and Yansong Meng

Multi-period PMF + FFT Acquisition Method Based on Symbol Estimation ................................................................. 297
Wen Liu, Tian-tong Gao, Zhong-liang Deng and Di Zhu

The Cubature Kalman Filter and Its Application in the Satellite Star-Sensor/Gyro Attitude Determination System .................. 307
Xiaobo Yuan, Chao Zhang and Chunling Shi

TC-OFDM Receiver Code Tracking Method Based on Extended Kalman Filter .......................................................... 317
Jun Mo, Zhongliang Deng, Buyun Jia, Xinmei Bian and Jichao Jiao

A RTK Float Ambiguity Estimation Method Based on GNSS/IMU Integration .............................................................. 329
Di Zhu, Zhong-liang Deng, Kai-qin Lin and Jun Lu

Accuracy Analysis of GNSS/INS Deeply-Coupled Receiver for Strong Earthquake Motion ............................................ 339
Hengrong Liu, Tisheng Zhang, Penghui Zhang, Farui Qi and Zhuo Li

Research on MEMS IMU Aided BeiDou Receiver
Carrier Loop Technology .......................................................... 351
Chunyu Liu, Lei Chen, Yangbo Huang, Ling Yong, Shaojie Ni and Feixue Wang

An Improved Robust Fading Filtering Algorithm for the GPS/INS Integrated Navigation ............................................... 363
Chen Jiang, Shu-bi Zhang and Qiu-zhao Zhang

Rapid Extrinsic Calibration of Seamless Multi-sensor Navigation System Based on Laser Scanning ............................. 377
Yanglin Zhou, Guangyun Li, Fengyang Li, Ming Dong and Shuaixin Li
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The GPS/INS Integrated Navigation Method Based on Adaptive SSR-SCKF Cubature Kalman Filter</td>
<td>395</td>
</tr>
<tr>
<td>Zhe Yue, Baowang Lian and Chengkai Tang</td>
<td></td>
</tr>
<tr>
<td>Shiwei Tian, Zhi Xiong, Guangxia Li, Jing Lv and Shi Yu</td>
<td></td>
</tr>
<tr>
<td>WLAN-Aided BDS Location Algorithm</td>
<td>417</td>
</tr>
<tr>
<td>Dengao Li, Zheng Wei, Jumin Zhao, Zhiyin Ma and Ya Liu</td>
<td></td>
</tr>
<tr>
<td>Gaussian Mixture Filter Based on Variational Bayesian Learning in PPP/SINS</td>
<td>429</td>
</tr>
<tr>
<td>Qing Dai, Lifen Sui, Yuan Tian and Tian Zeng</td>
<td></td>
</tr>
<tr>
<td>Zhenbo Liu, Qifan Zhou, Yongyuan Qin and Naser El-Sheimy</td>
<td></td>
</tr>
<tr>
<td>An Attitude Determination Algorithm by Integration of Inertial Sensor Added with Vision and Multi-antenna GNSS Data</td>
<td>459</td>
</tr>
<tr>
<td>Fengyang Li, Xuedong Jia, Yanglin Zhou, Ming Dong and Changyuan Chen</td>
<td></td>
</tr>
<tr>
<td>An Improved Vector Tracking Loop of Ultra-Tight Integration for Carrier Phase Tracking</td>
<td>475</td>
</tr>
<tr>
<td>Wei Li, Jiahe Xia and Guoda Cheng</td>
<td></td>
</tr>
<tr>
<td>Part IV PNT New Concept, New Methods and New Technology</td>
<td></td>
</tr>
<tr>
<td>Research on Doppler Locating Method of LEO Satellite Backup Navigation System</td>
<td>487</td>
</tr>
<tr>
<td>Zhixin Deng, Guangwei Fan and Chenglong He</td>
<td></td>
</tr>
<tr>
<td>A New Set of Spreading Code Based on Odd Kasami Sequence</td>
<td>497</td>
</tr>
<tr>
<td>Ruxia Wang, Zhongliang Deng and Di Zhu</td>
<td></td>
</tr>
<tr>
<td>Data Transfer Problem in Navigation Satellite Network Based on Agility Link</td>
<td>509</td>
</tr>
<tr>
<td>Zhenwei Hou, Xianqing Yi, Yue Zhao and Yaohong Zhang</td>
<td></td>
</tr>
<tr>
<td>Research on MIMU/UWB Integrated Indoor Positioning</td>
<td>521</td>
</tr>
<tr>
<td>Yishuai Shi, Ancheng Wang, Jinming Hao and Bo Jiao</td>
<td></td>
</tr>
<tr>
<td>Progress on Novel Atomic Magnetometer and Gyroscope Based on Self-sustaining of Electron Spins</td>
<td>535</td>
</tr>
<tr>
<td>S.G. Wang, C. Xu, Y.Y. Feng and L.J. Wang</td>
<td></td>
</tr>
</tbody>
</table>
Design of Buoy Array Configuration in the Autonomous Positioning System of Underwater Vehicles ............................... 543
Suyang Liu, Chunjie Qiao and Yangyang Wang

Hardware In-Loop System for X-ray Pulsar-Based Navigation and Experiments .................................................. 553
Dapeng Zhang, Wei Zheng, Lizhi Sheng, Yidi Wang and Neng Xu

Magnetic Field Based Indoor Pedestrian Positioning Using Self-contained Sensors .................................................. 565
Xiang Mu, Jiuchao Qian, Changqing Xu, Ling Pei, Peilin Liu and Wenxian Yu

3D Indoor Layered Localization of Multi-information Fusion Via Intelligent Terminal ........................................ 579
Leinan He and Hu Lu

Efficient and Robust Convex Relaxation Methods for Hybrid TOA/AOA Indoor Localization .................................. 591
Enwen Hu, Zhong-liang Deng, Lu Yin, Di Zhu, Jun Lu and Yanping Zhao

Hyperbola Positioning Scheme Based on Continuous Entangled Light and Bell State Direct Measurement ................. 607
Guan Fang, Chunyan Yang, Yang Bai, Xianglin Wang, Xiang Li and Kun Chen

Application of the Multipath Hemispheric Model in Monitoring Receiver .......................................................... 623
Tianxiang Su, Yuanlan Wen, Wei Feng, Guangming Liu, Hao Lan, Jiangwei Ma, Yun Zhang and Xu Zhang

The Test and Analysis on Pulse Signal Detection Abilities of the X-ray Detector MCP for Pulsar Navigation ............... 637
Qingyong Zhou, Lizhi Sheng, Ziqing Wei, Siwei Liu, Kun Jiang, Chun Chen, Jianfeng Ji, Hongfei Ren and Gaofeng Ma