

IEEE TRANSACTIONS ON
AEROSPACE AND ELECTRONIC SYSTEMS

APRIL 2024

VOLUME 60

NUMBER 2

IEARAX

(ISSN 0018-9251)

PAPERS

Ephemeris Tracking and Error Propagation Analysis of LEO Satellites With Application to Opportunistic Navigation	N. Khairallah and Z. M. Kassas	1242
DC Arc Model Superimposing Current-Controlled Arc Noise on a Heuristic Average Model	H. Zhao, Y. Chen, M. Tian, and X. Shi	1260
Design of Nonredundant Sparse Planar Arrays With Reduced Mutual Coupling	H. Yan, Y. Wang, L. Wang, R. Li, and W. Liu	1272
Robust STAP of Dictionary Local Adaptive Filling and Learning for Nonstationary Clutter Suppression	Q. Guo, L. Liu, M. Kaliuzhnyi, L. Chernogor, Y. Wang, and L. Qi	1284
Phase Compensation-Based 2D-DOA Estimation for EMVS-MIMO Radar	Z. Zhang, J. Shi, and F. Wen	1299
Momentum Adaption and Metalearning-Based DVR With Optimized Gains of Fractional-Order PID Controller	P. Kumar, S. R. Arya, and K. D. Mistry	1309
Minimum-Fuel Low-Thrust Trajectory Optimization via a Direct Adaptive Evolutionary Approach	A. Shirazi	1319
Generalized Ambiguity Function Analysis and Geometry Parameter Optimization for Flexible Conformal Array-MIMO Radar	Y. Jia, W.-Q. Wang, X.-C. Zhang, and B. Huang	1334
Fixed-Time Sliding Mode Coordinated Deployment Control for Space Triangle Tethered Formation System	X. Tao, F. Zhang, B. Huang, G. Shen, and P. Huang	1351
Power and Energy Management System of a Lunar Microgrid—Part I: Modeling Power Demand of ISRU	D. Saha, N. Bazmohammadi, A. Lashab, J. C. Vasquez, and J. M. Guerrero	1364
Power and Energy Management System of a Lunar Microgrid—Part II: Optimal Sizing and Operation of ISRU	D. Saha, N. Bazmohammadi, A. Lashab, J. C. Vasquez, and J. M. Guerrero	1376
Characterization of the 2.4- and 5-GHz Channels in a Single-Aisle Commercial Aircraft Cabin Using Ray Tracing	J. von Mankowski, H. Vijayaraghavan, Y. Hilla, and W. Kellerer	1386
Intelligent Suppression of Interferences Based on Reinforcement Learning	X. Zhang, L. Lan, S. Zhu, X. Li, G. Liao, and J. Xu	1400
Multiregion Mission Planning by Satellite Swarm Using Simulated Annealing and Neighborhood Search	X. Wu, Y. Yang, Y. Xie, Q. Ma, and Z. Zhang	1416
Optimized Scan Rate Modulation Jamming Against Sequential Lobing Radars	M. Kucuk, M. A. Nuhoglu, L. Durak-Ata, and H. A. Cirpan	1440
A Two-Stage Approach for TSNB and ITWB RFI Mitigation in P- and L-Band SAR Data	Z. Lv, Z. Zhang, H. Fan, Z. Chen, J. Qiu, and Y. Wu	1450
Complex Flexible Analytic Wavelet Transform for UAV State Identification Using RF Signal	V. K. Kashyap, R. R. Sharma, and R. B. Pachori	1471
ADS-B-Feature-Based Error Correction Method Implementation and Validation Using SDR	A. G. Aydin, M. Y. Polat, and A. Öncü	1482
Integrated Signal Design for MIMO DFRC With Intrapulse Index Modulation	X. Yao, J. Yang, K. Xiong, X. Yu, G. Cui, and X. Nie	1490

(Contents Continued on Page 1239)

Cooperative Fault-Tolerant Formation Tracking Control for Heterogeneous Air-Ground Systems Using a Learning-Based Method	<i>Y. Shi, Y. Hua, J. Yu, X. Dong, J. Lü, and Z. Ren</i>	1505
Radar Range-Doppler Flow: A Radar Signal Processing Technique to Enhance Radar Target Classification	<i>Q. Wen and S. Cao</i>	1519
Mainlobe Deceptive Jammer Mitigation With Subaperture-FDA-MIMO Radar	<i>F. Wei, S. Zhu, L. Lan, Z. Zhang, X. Li, and G. Liao</i>	1530
A Low Fuel-Consumption Drag-Free Tracking Approach for Space-Based Gravitational Wave Detection Satellite	<i>J. Wang, X. Guo, Z. Ma, C. Zhang, and J. Zhang</i>	1545
Sparsity-Based Processing to Enhance the Reverberation Suppression for FDA-MIMO Sonars	<i>M. Wu, C. Hao, Q. Hu, and D. Orlando</i>	1556
Aero-engine Degradation Evaluation Based on First-Order Transition Function and Gaussian Mapping Networks	<i>L. Ren, H. Qin, J. Xie, M. Jia, and Z. Xie</i>	1570
High-Speed UAV Swarms Detection via Coherent Integration and GTE-Based Super-Resolution Method	<i>Z. Zhao and X. Li</i>	1583
Dynamic Knowledge-Based Tracking and Autonomous Anomaly Detection	<i>J. Chai, S. He, H.-S. Shin, and A. Tsourdos</i>	1597
Composite Event-Triggered Intermittent Attitude Control of Spacecraft	<i>J. Lei, T. Meng, K. Wang, W. Wang, and S. Sun</i>	1612
Contrastive Learning and Cycle Consistency-Based Transductive Transfer Learning for Target Annotation	<i>S. M. Sami, M. M. Hasan, N. M. Nasrabadi, and R. Rao</i>	1628
Symbolic Dynamics for Radar Target Maneuver Detection With High Data Rates	<i>P. G. Singerman, S. M. O'Rourke, R. M. Narayanan, A. Ray, and M. Rangaswamy</i>	1647
Prediction Method of Agile Satellite's In-View Periods Based on Analytical Bounding Curves	<i>S. Bai, Y. Chen, and Y. Zhang</i>	1660
The Comparison of Riemannian Geometric Matrix-CFAR Signal Detectors	<i>Y. Ono and L. Peng</i>	1679
Integration of Imaging and Recognition for Marine Targets in Fast-Changing Attitudes With Multistation Wideband Radars	<i>S. Shao, H. Liu, and J. Yan</i>	1692
Real-Time Multiconstrained Polynomial Guidance Based on Analytical Gradient Derivation	<i>P. Shi, S. Guan, L. Cheng, W. Li, and X. Huang</i>	1711
Aircraft Detection and Classification Based on Joint Probability Detector Integrated With Scattering Attention	<i>X. Xiao, H. Jia, Q. Wang, P. Xiao, C. Fan, Z. Li, and H. Wang</i>	1722
MIMO Radar: An H-Infinity Approach for Robust Multitarget Tracking in Unknown Cluttered Environment	<i>Y. Liu and A. Manikas</i>	1740
Dictionary Learning-Structured Reinforcement Learning With Adaptive-Sparsity Regularizer	<i>Z. Li, J. Tang, H. Zhao, C. Chen, and S. Xie</i>	1753
Position/Force Control for a Dual-Arm Space Manipulator Gripping and Transporting an Unknown Target Without Grapple Fixtures	<i>M. Wang, L. Zong, and J. Yuan</i>	1770
Distributed Approximate Optimal Attitude Control of Combined Spacecraft With Parameters Identification	<i>M. Wang, B. Wu, Y. Geng, and D. Wang</i>	1784
MIMO Radar Unimodular Waveform Design With Learned Complex Circle Manifold Network	<i>K. Zhong, J. Hu, Z. Zhao, X. Yu, G. Cui, B. Liao, and H. Hu</i>	1798
Multiobjective Variable Neighborhood Descent for Heterogeneous Multi-UAV Coordinated Scheduling	<i>H. Liu, G. Wu, B. Ji, and L. Wang</i>	1808
Low Scattering Performance and Scattering Center Characteristics of Streamlined Space Target	<i>Z. Xu, Y. Zhu, X. Ai, Q. Wu, and F. Zhao</i>	1824
Radar-Based Human Activity Recognition Using Dual-Stream Spatial and Temporal Feature Fusion Network	<i>J. Li, H. Xu, J. Zeng, W. Ai, S. Li, X. Li, and X. Li</i>	1835
Antenna Array and Waveform Design for 4-D-Imaging mmWave MIMO Radar Sensors	<i>N. Karimian-Sichani, M. Alaei-Kerahroodi, B. S. Mysore Rama Rao, E. Mehrshahi, and S. A. Ghorashi</i>	1848
Hybrid FSO/Sub-THz-Based Vertical Networks for Internet of Vehicles	<i>H. D. Le, C. T. Nguyen, T. K. Nguyen, and A. T. Pham</i>	1865
A Lightweight Convolutional Neural Network for Ship Target Detection in SAR Images	<i>Y. Hao and Y. Zhang</i>	1882
Recurrent Waveform Optimization for Desired Range-Doppler Profile With Low Probability of Interception: A Particle Filter Approach	<i>X. Feng, L. Wu, Y. Zhao, Z. Zhao, K. Diao, and M. Soltanianian</i>	1899
Two-Stage Framework for Specialty Vehicles Detection and Classification: Toward Intelligent Visual Surveillance of Airport Surface	<i>M. Ding, W. Zhou, Y. Xu, and Y. Xu</i>	1912

Switching Anti-windup Synthesis for Linear Systems Subject to Asymmetric Input Magnitude and Rate Saturation: Application to Aircraft Engines	K. Wang, S.-X. Wen, Y.-F. Gao, X. Zhang, and X.-M. Sun	1924
Learning Neural Network-Based Fault-Tolerant Formation Control for Elliptical Orbit Spacecraft	Q. Jia, R. Shu, C. K. Ahn, and C. Zhang	1937
Target Detection Performance of Distributed MIMO Radar Systems Under Nonideal Conditions	Y. Liang, G. Wen, L. Zhu, D. Luo, Y. Kuai, and B. Li	1951
An Optimization Algorithm-Based Coherence Method for the DCAR Tracking Process ..	W. Zhang, C. Miao, and W. Wu	1970
An MTI-Like Approach for Interference Mitigation in FMCW Radar Systems	L. A. López-Valcárcel, M. García Sánchez, F. Fioranelli, and O. A. Krasnov	1985
Human-Assisted Regulation of the Deployment of a Tethered Space Robot via Feasibility Condition Optimization and Fast Logarithmic Sliding Mode	Z. Ma, X. Duan, X. Liu, Y. Zhang, and P. Huang	2001
Multidomain Resource Allocation for Asynchronous Target Tracking in Heterogeneous Multiple Radar Networks With Nonideal Detection	C. Shi, Z. Tang, L. Ding, and J. Yan	2016
Multitone Waveform Design Toward Enhancing Conversion Efficiency for RF Electronics Detection	Y. Li, W. Hu, H. Fan, X. Du, and B. Fan	2034
Intelligent Safety Flight Control With Variable Prescribed Performance	X. Bu, M. Lv, and Z. Liu	2050
Intelligent Interference Waveform Design for Radar Detection Based on the Cross-Correlation Value Function	H. Wang, T. Hu, T. Li, D. Wu, Z. Xu, X. Xu, and Z. Tian	2061
High-Altitude Terminal Control of Anti-Air Missiles With a Terminal Booster and Front Lateral Impulse Thrusters	H.-M. Jeon, T. Y. Kang, J. Park, and C.-K. Ryoo	2071
Underactuated Attitude–Orbit Coupling Control for Microsatellite Based on a Single Orbital Thruster	J. Lu and Z. Meng	2082
Accurate Localization of Intruder Drone by UAV Mounted Adaptable Radar Antenna in Restricted Areas	P. Mandal, L. P. Roy, and S. K. Das	2093
Hybrid SAR-ISAR Imaging for Space Target via 2-D Spectrum and SIHR With Spaceborne Radar	R. Chen and Y. Jiang	2106
Debiased Linear Measurement Matrix-Based Linear Sequential Filtering for Radar Tracking	T. Cheng, Y. Wang, and Z. He	2128
Error Mitigation Using Optimized Redundancy for Composite Algorithms in FPGAs	L. A. Garcia-Astudillo, A. Lindoso, and L. Entrena	2143
NU-SCGRFT-Based Coherent Integration Method for High-Speed Maneuvering Target Detection and Estimation in Bistatic PRI-Agile Radar	X. Li, K. Zhao, M. Wang, G. Cui, and T. S. Yeo	2153
Real-Time Satellite Constellation Scheduling for Event-Triggered Cooperative Tracking of Space Objects	H. Yang, Y. Zhang, X. Bai, and S. Li	2169
Mode-Recovered Bumpless Transfer Control for Aeroengines With Switched Models ..	Z. Wu, Y. Shi, Z. Fei, and X. Liu	2183
Adaptive Constrained Attitude Control of Spacecraft With Compatible and Guaranteed Performance	J. Lei, T. Meng, Y. Zhu, K. Wang, and W. Wang	2193
Clutter Suppression in Passive ISAR Using Compressive Sensing	M. Azimifar and M. A. Sebt	2210
Fixed-Time Zero-Sum Pursuit–Evasion Game Control of Multisatellite via Adaptive Dynamic Programming	Z. Zhang, K. Zhang, X. Xie, and J. Sun	2224
Kalman Filter Auto-Tuning With Consistent and Robust Bayesian Optimization	Z. Chen, H. Biggie, N. Ahmed, S. Julier, and C. Heckman	2236
An Algorithm Fusing State Estimation and TDOA Filtering for UAV Tracking Enhancement ..	Z. Zhang and Z. Huang	2251
Multi-UAV Flocking Control With a Hierarchical Collective Behavior Pattern Inspired by Sheep	W. Han, J. Wang, Y. Wang, and B. Xu	2267
A Pesticide Spraying Mission Allocation and Path Planning With Multicopters	J. Huang, B. Du, Y. Zhang, Q. Quan, B. Wang, and L. Mu	2277
An Improved Artificial Electric Field Algorithm for Robot Path Planning	J. Tang, Q. Pan, Z. Chen, G. Liu, G. Yang, F. Zhu, and S. Lao	2292
Interchangeable Reinforcement-Learning Flight Controller for Fixed-Wing UASs	M. Chowdhury and S. Keshmire	2305
Joint Pulsed and Continuous Wave Interference Suppression for Dual-Antenna GNSS Receivers	W. Wang, H. Chen, and X. Lu	2319
Closed-Form Solutions of Miss Distance for Higher-Order Guidance System ..	X. Gong, W. Chen, Z. Chen, and W. Yuan	2331
Optimal-Control-Based Evaluation of Mission-Oriented Power Systems	M. Sabah and A. M. Cramer	2350

Synodic Period Channel Modeling and Coding Scheme for Deep Space Optical Communications.....	Y. Zhang, J. Jiao, K. Zhang, Y. Wang, R. Lu, and Q. Zhang	2364
Federated Learning for Radar Gesture Recognition Based on Spike Timing-Dependent Plasticity	M. Zhang, B. Li, H. Liu, and C. Zhao	2379
Robust Attitude Tracking Control Based on Adaptive Dynamic Programming for Flexible Dumbbell-Shaped Spacecraft	W. Huang, G. Ran, B. Wang, D. Li, and W. Dong	2394
Spinning-Up Control of a Conical Scanning Imaging Satellite	R. Xi, X. Cao, F. Wu, X. Chen, and S. Qiu	2407
<hr/>		
CORRESPONDENCE		
Maximal Invariants for Subspace Signal Detection in Unknown Interference With Multiple Observations.....	R. S. Raghavan	2422
Performance Analysis of Linearly Combined Order Statistics CFAR Processors in Heterogeneous Background	J. Zhou and J. Xie	2428
One-Bit DoA Estimation for Deterministic Signals Based on $\ell_{2,1}$ -Norm Minimization.....	M. Chen, Q. Li, X. P. Li, L. Huang, and M. Rihan	2438
Geometric Distribution of UAV Detection Performance by Bistatic Radar	N. Hu, Y. Li, W. Pan, S. Shao, Y. Tang, and X. Li	2445
Wideband DOA Estimation With Frequency Decomposition via a Unified GS-WSpSF Framework.....	M. Wang, Q. Shen, W. Liu, and W. Cui	2453
Performance Analysis of Mainlobe Canceller for Monopulse At Subarray Level in the Presence of Amplitude-Phase Error	H. Wu, R. Liu, Y. Guo, J. Zhang, F. He, and J. Meng	2461
Reinforcement Learning for Energy-Efficient User Association in UAV-Assisted Cellular Networks.....	Z. Kaleem, W. Khalid, A. Ahmad, H. Yu, A. M. Almasoud, and C. Yuen	2474
<hr/>		
LETTERS		
A Loop-Gain-Adaptive-Adjustment Method Based on Fuzzy Logic for Timing Recovery in Space TT&C Systems	Y. He, X. Shi, Y. Wang, and X. Jin	2482
Unveiling Starlink LEO Satellite OFDM-Like Signal Structure Enabling Precise Positioning	M. Neinavaie and Z. M. Kassas	2486
<hr/>		
CORRECTIONS		
Erratum to “Bayesian Linear Regression With Cauchy Prior and Its Application in Sparse MIMO Radar”	J. Li, R. Wu, I-T. Lu, and D. Ren	2490