

# IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY

A PUBLICATION OF THE IEEE VEHICULAR TECHNOLOGY SOCIETY

APRIL 2020

VOLUME 69

NUMBER 4

ITVTAB

(ISSN 0018-9545)

---

## REGULAR PAPERS

<i>Connected Vehicle Series</i>		
Enhancing Video Streaming in Vehicular Networks via Resource Slicing .....	H. Khan, S. Samarakoon, and M. Bennis	3513
<i>Channel Models</i>		
Performance Analysis of Cell-Free Massive MIMO Systems: A Stochastic Geometry Approach .....	A. Papazafeiropoulos, P. Kourtessis, M. D. Renzo, S. Chatzinotas, and J. M. Senior	3523
Modeling and Analysis of the Uplink Local Delay in MEC-Based VANETs .....	Y. Wu and J. Zheng	3538
Measurements and Analysis of Propagation Channels in Vehicle-to-Infrastructure Scenarios .....	W. Li, X. Hu, J. Gao, L. Zhao, and T. Jiang	3550
<i>Communication Circuits &amp; Systems</i>		
Efficient Sparse Code Multiple Access Decoder Based on Deterministic Message Passing Algorithm .....	C. Zhang, C. Yang, X. Pang, W. Song, W. Xu, S. Zhang, Z. Zhang, and X. You	3562
Low-Latency Segmented List-Pruning Software Polar List Decoder .....	Y. Shen, L. Li, J. Yang, X. Tan, Z. Zhang, X. You, and C. Zhang	3575
<i>Transportation Systems</i>		
Active Fault Diagnosis Method for Vehicles in Platoon Formation .....	A. Lopes and R. E. Araújo	3590
Detecting Motion Blurred Vehicle Logo in IoV Using Filter-DeblurGAN and VL-YOLO .....	L. Zhou, W. Min, D. Lin, Q. Han, and R. Liu	3604
Synthesis of Cooperative Adaptive Cruise Control With Feedforward Strategies .....	Y. Zhu, D. Zhao, and H. He	3615
Robust Observer Based Intermittent Forces Estimation for Driver Intervention Identification .....	C. Huang, L. Li, Y. Liu, and L. Xiao	3628
Integrated Timetable Optimization for Minimum Total Energy Consumption of an AC Railway System .....	Z. Pan, M. Chen, S. Lu, Z. Tian, and Y. Liu	3641
MagLand: Magnetic Landmarks for Road Vehicle Localization .....	S. B. Cruz and A. Aguiar	3654
Vectoring Algorithm of Electronic-Four-Wheel Drive Vehicles for Enhancement of Cornering Performance .....	G. Park, K. Han, K. Nam, H. Kim, and S. B. Choi	3668

---

(Contents Continued on Page 3510)



---

Extracting and Predicting Taxi Hotspots in Spatiotemporal Dimensions Using Conditional Generative Adversarial Neural Networks .....	H. Yu, Z. Li, G. Zhang, P. Liu, and J. Wang	3680
<i>Vehicular Electronics</i>		
Dynamic Output Feedback Fault Tolerant Control for Unmanned Underwater Vehicles .....	X. Wang and C. P. Tan	3693
Interference Characterization and Power Optimization for Automotive Radar With Directional Antenna .....	P. Chu, J. A. Zhang, X. Wang, Z. Fei, G. Fang, and D. Wang	3703
A Multifunctional Solar PV and Grid Based On-Board Converter for Electric Vehicles .....	A. K. Singh, M. Badoni, and Y. N. Tatte	3717
Reduced-Order Modeling and Design of Single-Stage LCL Compensated IPT System for Low Voltage Vehicle Charging Applications .....	H. Feng and S. M. Lukic	3728
An IMM-UKF Aided SINS/USBL Calibration Solution for Underwater Vehicles .....	Y. Yao, X. Xu, D. Yang, and X. Xu	3740
A Universal and Reconfigurable Stability Control Methodology for Articulated Vehicles With Any Configurations .....	Y. Zhang, A. Khajepour, and M. Ataei	3748
A Reconfigurable On-Board Power Converter for Electric Vehicle With Reduced Switch Count .....	S. R. Meher, S. Banerjee, B. T. Vankayalapati, and R. K. Singh	3760
Electric Vehicle Powertrain and Fuzzy Control Multi-Objective Optimization, Considering Dual Hybrid Energy Storage Systems .....	J. J. Eckert, L. C. deA. Silva, F. G. Dedini, and F. C. Corrêa	3773
Real-Time Perception and Positioning for Creature Picking of an Underwater Vehicle .....	S. Cui, Y. Wang, S. Wang, R. Wang, W. Wang, and M. Tan	3783
A Single-Phase On-Board Two-Stage Integrated Battery Charger for EVs Based on a Five-Phase Hybrid-Excitation Flux-Switching Machine .....	M. Tong, M. Cheng, W. Hua, and S. Ding	3793
Torque Vectoring and Rear-Wheel-Steering Control for Vehicle's Uncertain Slips on Soft and Slope Terrain Using Sliding Mode Algorithm .....	Z. Liang, J. Zhao, Z. Dong, Y. Wang, and Z. Ding	3805
A Fast Robust In-Motion Alignment Method for SINS With DVL Aided .....	X. Xu, Y. Sun, J. Gui, Y. Yao, and T. Zhang	3816
Analysis and Design of a Voltage Equalizer Based on Boost Full-Bridge Inverter and Symmetrical Voltage Multiplier for Series-Connected Batteries .....	X. Yang, L. Xi, Z. Gao, Y. Li, and J. Wen	3828
MEMS Gyro Bias Estimation in Accelerated Motions Using Sensor Fusion of Camera and Angular-Rate Gyroscope .....	A. Nazemipour, M. T. Manzuri, D. Kamran, and M. Karimian	3841
Sensor Fault Detection and Isolation Using a Support Vector Machine for Vehicle Suspension Systems .....	K. Jeong, S. B. Choi, and H. Choi	3852
<i>Wireless Communications</i>		
Joint OAM Multiplexing and OFDM in Sparse Multipath Environments .....	L. Liang, W. Cheng, W. Zhang, and H. Zhang	3864
Adaptive Bitrate Streaming in Wireless Networks With Transcoding at Network Edge Using Deep Reinforcement Learning .....	Y. Guo, F. R. Yu, J. An, K. Yang, C. Yu, and V. C. M. Leung	3879
Response-Time Analysis for Controller Area Networks With Randomly Occurring Messages .....	R. Sato and S. Fukumoto	3893
Energy-Efficient SWIPT-Empowered D2D Mode Selection .....	J. Huang, J. Cui, C.-C. Xing, and H. Gharavi	3903
Low-Complexity Channel Estimation for Circular and Noncircular Signals in Virtual MIMO Vehicle Communication Systems .....	X. Wang, L. Wan, M. Huang, C. Shen, Z. Han, and T. Zhu	3916
Graph Theory Based Beam Scheduling for Inter-Cell Interference Avoidance in MmWave Cellular Networks .....	Z. Sha, Z. Wang, S. Chen, and L. Hanzo	3929
Attractor Selection Based Limited Feedback Hybrid Precoding for Uplink V2I Communications .....	J. Ye and H. Gharavi	3943
Energy-Efficient and Secure Air-to-Ground Communication With Jittering UAV .....	H. Wu, Y. Wen, J. Zhang, Z. Wei, N. Zhang, and X. Tao	3954
A Fast Beam Alignment Scheme for Dual-Band HSR Wireless Networks .....	L. Yan, X. Fang, L. Hao, and Y. Fang	3968
Adaptive Bitrate Video Streaming in Non-Orthogonal Multiple Access Networks .....	J. Zhang, H. Wu, X. Tao, and X. Zhang	3980

---

---

Security Enhancement for NOMA-UAV Networks . . . . .	<i>N. Zhao, Y. Li, S. Zhang, Y. Chen, W. Lu, J. Wang, and X. Wang</i>	3994
Energy-Efficient Resource Allocation for High-Rate Underlay D2D Communications With Statistical CSI: A One-to-Many Strategy . . . . .	<i>R. Li, P. Hong, K. Xue, M. Zhang, and T. Yang</i>	4006
Wideband Ultrasonic Acoustic Underwater Channels: Measurements and Characterization . . . . .	<i>J. López-Fernández, U. Fernández-Plazaola, J. F. Paris, L. Díez, and E. Martos-Naya</i>	4019
Secure Degrees of Freedom of Rank-Deficient BCCM and Rank-Deficient ICCM . . . . .	<i>Q. Wang, T. Zhang, D. Dong, and X. Li</i>	4033
Streaming Delay-, Expenditure- and Quality-Balanced Video Over TV White Space . . . . .	<i>M. Wang, B. Cheng, N. UL Hassan, J. Wu, and C. Yuen</i>	4042
Hybrid Combining Based on Constant Phase Shifters and Active/Inactive Switches . . . . .	<i>E. E. Bahingayi and K. Lee</i>	4058
Joint Radar-Communication With Cyclic Prefixed Single Carrier Waveforms . . . . .	<i>Y. Zeng, Y. Ma, and S. Sun</i>	4069
Secure Single-Input-Multiple-Output Media-Based Modulation . . . . .	<i>T. Mao, Q. Wang, M. Wen, and Z. Wang</i>	4080
Pairing Distance Resolution and Power Control for Massive Connectivity Improvement in NOMA Systems . . . . .	<i>S. Mounchili and S. Hamouda</i>	4093
Multi-Frame Track-Before-Detect Algorithm for Maneuvering Target Tracking . . . . .	<i>W. Yi, Z. Fang, W. Li, R. Hoseinnezhad, and L. Kong</i>	4104
Performance Analysis of MISINR User Association in 3-D Heterogeneous Cellular Networks . . . . .	<i>H. Ding, F. Zhao, J. Tian, and H. Zhang</i>	4119
Predicted Decoupling for Coexistence Between WiFi and LTE in Unlicensed Band . . . . .	<i>F. Tian, Y. Yu, X. Yuan, B. Lyu, and G. Gui</i>	4130
<i>Wireless Networks</i>		
Push the Limit of Multipath Profiling Using Commodity WiFi Devices With Limited Bandwidth . . . . .	<i>H. Xue, J. Yu, F. Lyu, and M. Li</i>	4142
Multi-Item Auction Based Mechanism for Mobile Data Offloading: A Robust Optimization Approach . . . . .	<i>D. Liu, A. Hafid, and L. Khoukhi</i>	4155
Fractional Dynamic Caching: A Collaborative Design of Storage and Backhaul . . . . .	<i>L. Wang and S. Zhou</i>	4169
DAGIoV: A Framework for Vehicle to Vehicle Communication Using Directed Acyclic Graph and Game Theory . . . . .	<i>V. Hassija, V. Chamola, G. Han, J. J. P. C. Rodrigues, and M. Guizani</i>	4182
Cyber-Physical Scheduling for Predictable Reliability of Inter-Vehicle Communications . . . . .	<i>C. Li, H. Zhang, T. Zhang, J. Rao, L. Y. Wang, and G. Yin</i>	4192
Trajectory Optimization for UAVs' Efficient Charging in Wireless Rechargeable Sensor Networks . . . . .	<i>P. Wu, F. Xiao, C. Sha, H. Huang, and L. Sun</i>	4207
Blockchain Empowered Cooperative Authentication With Data Traceability in Vehicular Edge Computing . . . . .	<i>H. Liu, P. Zhang, G. Pu, T. Yang, S. Maharjan, and Y. Zhang</i>	4221
Uplinks Schedulers for RF-Energy Harvesting Networks With Imperfect CSI . . . . .	<i>Y. Liu, K.-W. Chin, and C. Yang</i>	4233
Accessibility Analysis and Modeling for IoV in an Urban Scene . . . . .	<i>J. Cheng, G. Yuan, M. Zhou, S. Gao, C. Liu, H. Duan, and Q. T. Zeng</i>	4246
Hierarchical Offloading for Delay-Constrained Applications in Fog RAN . . . . .	<i>K. Guo, M. Sheng, J. Tang, T. Q. S. Quek, and Z. Qiu</i>	4257
Mode Selection and Resource Allocation in Sliced Fog Radio Access Networks: A Reinforcement Learning Approach . . . . .	<i>H. Xiang, M. Peng, Y. Sun, and S. Yan</i>	4271
Whale Optimization Algorithm With Applications to Resource Allocation in Wireless Networks . . . . .	<i>Q.-V. Pham, S. Mirjalili, N. Kumar, M. Alazab, and W.-J. Hwang</i>	4285
Blockchain Empowered Asynchronous Federated Learning for Secure Data Sharing in Internet of Vehicles . . . . .	<i>Y. Lu, X. Huang, K. Zhang, S. Maharjan, and Y. Zhang</i>	4298
Deep Reinforcement Learning and Permissioned Blockchain for Content Caching in Vehicular Edge Computing and Networks . . . . .	<i>Y. Dai, D. Xu, K. Zhang, S. Maharjan, and Y. Zhang</i>	4312
Pair Auction and Matching for Resource Allocation in Full-Duplex Cellular Systems . . . . .	<i>C.-C. Chao, C.-Y. Wang, C.-H. Lee, H.-Y. Wei, and W.-T. Chen</i>	4325

---

---

A New Quaternion Kalman Filter Based Foot-Mounted IMU and UWB Tightly-Coupled Method for Indoor Pedestrian Navigation .....	K. Wen, K. Yu, Y. Li, S. Zhang, and W. Zhang	4340
Analysis on Computation-Intensive Status Update in Mobile Edge Computing .....	Q. Kuang, J. Gong, X. Chen, and X. Ma	4353
Joint Unmanned Aerial Vehicle (UAV) Deployment and Power Control for Internet of Things Networks .....	S. Fu, Y. Tang, N. Zhang, L. Zhao, S. Wu, and X. Jian	4367
Energy-Efficient Robust Computation Offloading for Fog-IoT Systems .....	Z. Wu, B. Li, Z. Fei, Z. Zheng, B. Li, and Z. Han	4379
HetMEC: Heterogeneous Multi-Layer Mobile Edge Computing in the 6 G Era .....	Y. Zhang, B. Di, P. Wang, J. Lin, and L. Song	4388
Learning Based Joint Cache and Power Allocation in Fog Radio Access Networks .....	G. M. S. Rahman, M. Peng, S. Yan, and T. Dang	4401
Security Enhanced Content Sharing in Social IoT: A Directed Hypergraph-Based Learning Scheme .....	B. Wang, Y. Sun, T. Q. Duong, L. D. Nguyen, and N. Zhao	4412
Complex Network Analysis of VANET Topology With Realistic Vehicular Traces .....	X. Qu, E. Liu, R. Wang, and H. Ma	4426
Poisoning and Evasion Attacks Against Deep Learning Algorithms in Autonomous Vehicles .....	W. Jiang, H. Li, S. Liu, X. Luo, and R. Lu	4439
Gait Learning Based Authentication for Intelligent Things .....	H. Zhang, J. Liu, K. Li, H. Tan, and G. Wang	4450
Proportional-Fair Multi-User Scalable Layered Wireless Video Streaming Powered by Energy Harvesting .....	J. Yang, J. Xie, S. Chen, Z. Wang, H. Hu, and L. Hanzo	4460
Latency Minimization for D2D-Enabled Partial Computation Offloading in Mobile Edge Computing .....	U. Saleem, Y. Liu, S. Jangsher, X. Tao, and Y. Li	4472

---

#### CORRESPONDENCE

<i>Communication Circuits &amp; Systems</i>		
Adaptive Deep Learning Aided Digital Predistorter Considering Dynamic Envelope .....	J. Sun, J. Wang, L. Guo, J. Yang, and G. Gui	4487
<i>Wireless Communications</i>		
A MIMO Detector With Deep Learning in the Presence of Correlated Interference .....	J. Xia, K. He, W. Xu, S. Zhang, L. Fan, and G. K. Karagiannidis	4492
Reconfigurable Intelligent Surfaces Assisted Communications With Limited Phase Shifts: How Many Phase Shifts Are Enough? .....	H. Zhang, B. Di, L. Song, and Z. Han	4498
Secure Outage Analysis for Cooperative NOMA Systems With Antenna Selection .....	X. Pei, H. Yu, M. Wen, Q. Li, and Z. Ding	4503
Gibbs Distribution Based Antenna Splitting and User Scheduling in Full Duplex Massive MIMO Systems .....	M. Guo and M. C. Gursoy	4508
Performance Analysis of NOMA Enabled Hybrid Network With Limited Feedback .....	P. Swami, M. K. Mishra, V. Bhatia, and T. Ratnarajah	4516
Uplink NOMA Random Access Systems With Space-Time Line Code .....	J.-B. Seo, H. Jin, J. Joung, and B. C. Jung	4522
Practical Hybrid Beamforming With Finite-Resolution Phase Shifters for Reconfigurable Intelligent Surface Based Multi-User Communications .....	B. Di, H. Zhang, L. Li, L. Song, Y. Li, and Z. Han	4527
Secrecy Performance of User and Antenna Selection With Channel Estimation Inaccuracy .....	D. Lee	4533
Efficient Receiver Design for Uplink Cell-Free Massive MIMO With Hardware Impairments .....	J. Zheng, J. Zhang, L. Zhang, X. Zhang, and B. Ai	4537
WiFi-Assisted Control Traffic Offloading in Vehicular Environments .....	H. Qin, B. Cao, W. Chen, X. Xiao, and Y. Peng	4542
A Novel Probabilistic Buffer-Aided Relay Selection Scheme in Cooperative Networks .....	P. Xu, Z. Yang, Z. Ding, I. Krikidis, and Q. Chen	4548
Spatial Modulation for Terahertz Communication Systems With Hardware Impairments .....	T. Mao, Q. Wang, and Z. Wang	4553
Reduced Complexity Sparse Recovery Detectors for Differential Space Shift Keying MIMO System .....	M. Alshawaqfeh and R. Mesleh	4558

(Contents Continued from Page 3512)

---

Receive Beamforming and Resource Allocation for Wireless Powered Non-Orthogonal Multiple Access .....	C. Lee and Y. H. Kim	4563
Completion Time Minimization for Turning Angle-Constrained UAV-to-UAV Communications .....	H. Wang, J. Wang, G. Ding, J. Chen, and J. Yang	4569
Deep Learning-Based Cooperative Automatic Modulation Classification Method for MIMO Systems .....	Y. Wang, J. Wang, W. Zhang, J. Yang, and G. Gui	4575
Performance Analysis of Dual-Hop Relaying With I/Q Imbalance and Additive Hardware Impairment .....	Y. Gao, Y. Chen, N. Chen, and J. Zhang	4580
Antenna Array Diagnosis for Millimeter-Wave MIMO Systems .....	S. Ma, W. Shen, J. An, and L. Hanzo	4585
Energy Efficiency Maximization for Full-Duplex UAV Secrecy Communication .....	B. Duo, Q. Wu, X. Yuan, and R. Zhang	4590
<i>Wireless Networks</i>		
Joint Optimization of Cooperative Communication and Computation in Two-Way Relay MEC Systems .....	B. Xie, Q. Zhang, and J. Qin	4596
Modeling Impact of Concurrent Transmissions in Cluster Based Mobile Caching Networks .....	A. Ahmed, H. Shan, and A. Huang	4601

---