2022 25th International Symposium on Wireless Personal Multimedia Communications (WPMC 2022)

Herning, Denmark
30 October – 2 November 2022

IEEE Catalog Number: CFP22WPC-POD
ISBN: 978-1-6654-7319-4

Copyright © 2022 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP22WPC-POD
ISBN (Print-On-Demand):	978-1-6654-7319-4
ISBN (Online):	978-1-6654-7318-7
ISSN:	1347-6890

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

Video Transmission Trial by Wireless Multi-Hop Network Based on Wi-SUN FAN 1
Reo Gakumi, Hiroko Masaki, Keiichi Mizutani, Hiroshi Harada

Delivering 360-Degree Video with Viewport-Adaptive Truncation 7
Tian Qiu, Ish Kumar Jain, Raini Wu, Dinesh Bharadia, Pamela Cosman

A Novel Routing Protocol Based on Prediction of Energy Consumption and Link Stability in Mobile Internet of Thing (MIoT) 12
Seyed Salar Sefati, Ahmed M. Nor, Simona Halunga, Octavian Fratu

Low-Latency Frame Forwarding Scheme Applicable to the Heterogeneous Channel Allocated Low-Energy Wireless Grid Structure 17
Fumihide Kojima

Smart LSTM-Based IDS for Heterogeneous IoT (HetIoT) 23
Shalaka S. Mahadik, Pranav M. Pawar, Raja Muthalagu, Neeli Rashmi Prasad, Dnyaeshwar Mantri

Electrically Small, Metamaterial-Inspired Monopole Antennas for WLAN Applications 29
Christos Milias, Rasmus B. Andersen, Pavlos I. Lazaridis, Zaharias D. Zaharis, Bilal Muhammad, Jes T. B. Kristensen, Albena Mihvoska, Dan D. S. Hermansen

Performance Evaluation of Polarization Sensitive Array Based DOA Estimation 33
Bowen Wang, Nanxi Li, Hang Yin, Jianchi Zhu, Xiaoming She, Jianxiu Wang, Peng Chen

Design of 3-Bit Reflection Type Digital Phase Shifter for Regional ISM Band 38
Engr. Hafsa Talpur, Badar Muneer, Bhawani Shankar Chowdhry, Engr. Rabia Shaikh

Waveform Analysis of DFT-Spread OFDM with Phase Rotation and Π /2-4PAM for Efficient Wireless Transmission 42
Hikaru Kawasaki, Takeshi Matsumura

Throughput Evaluation of UL-NOMA Systems with Successive Interference Cancellation and Repetition 48
Masahiro Yamazoe, Masafumi Moriyama, Takashi Matsuda, Takeshi Matsumura

Adaptive Collaborative Relaying in High Mobility Environment 54
Satoshi Denno, Takuma Fujii, Yafei Hou

An Analog Self-Interference Canceller Applicable to 5G NR-based In-band Full-duplex Supporting 100 MHz Bandwidth Signal 59
Takeshi Matsumura

Cost Revenue Trade-Off for the 5G NR Small Cell Network in the Sub-6 GHz Operating Band 64
Bahram Khan, Nidhi Nidhi, Rui R Paulo, Albena Mihovska, Fernando J. Velez

Utilizing Cognitive Radio and Reinforcement Learning for Multiple Preamble Detection in 5G-PRACH 70
Syeda Sundus Zehra, Rehan Qureshi, Muhammad Aamir, Maurizio Magarini

Automatic Modulation Classification Using Graph Convolutional Neural Networks for Time-Frequency Representation 75
Krasimir Tonchev, Nikolay Neshov, Antoni Ivanov, Agata Manolova, Vladimir Poulkov

Ablation Study of Deep Reinforcement Learning Congestion Control in Cellular Network Settings 80
Haidlir Naqvi, Bayu Anggorojati

Public Private Data Partnerships Enabling Privacy Technologies 86
Aaloka Anant, Ramjee Prasad

Universal Vertical Applications Adaptation for Open RAN: A Deep Reinforcement Learning Approach 92
Yi-Cheng Huang, Shao-Yu Lien, Chih-Cheng Tseng, Der-Jiunn Deng, Kwang-Cheng Chen

A Proposal of an End-To-End DoA Estimation System Aided by Deep Learning 98
Daniel Akira Ando, Toshihiko Nishimura, Takanori Sato, Takeo Ohgane, Yasutaka Ogawa, Junichiro Hagiwara

RadioResUNet: Wireless Measurement by Deep Learning for Indoor Environments 104
Chang-Woo Pyo, Hirokazu Sawada, Takeshi Matsumura

Development and Validation of Dataset for Intrusion Detection System Over Real Traffic 110
Shafqat Ali Siyyal, Faheem Yar Khuhawar, Muhammad Raza Shaikh, Aftab A. Memon, Bhawani S. Chowdhry, M. Zakir Shaikh, Ambuj Kumar, Muhammad Aslam Uqaili

Green Business Model Innovation Technology Competences - What Green Technology Competences Are Needed to Do More and Trusted Green Business Model Innovation 116
Peter Lindgren

The Emergence of Green Business Modeling Innovation Ecosystem Platform Facilitating Green Digitalization with Open-Source Software..... 122
Per Valter, Peter Lindgren, Ramjee Prasad

Business Model Archetypes. a Systematic Literature Review..... 128
Rita Madsen, Peter Lindgren, Susanne Durst

A Review of Artificial Intelligence in Foreign Language Learning 134
Despoina N. Gkountara, Ramjee Prasad

5G New Radio Simulator for Wireless Communications Using Millimeter Wave Band 140
Javier Otero Martínez, Kun Chen Hu, Ana García Armada

UWB Medium Access with Assistance of Pilot Narrow Band Radio..... 146
Huan-Bang Li, Takeshi Matsumura

ROAD Value-Based DME Detection and OBE Enhanced DME Mitigation for LDACS..... 152
Miziya K, Raja Muthalagu, Abdul Rajak, Pranav M. Pawar, Neeli Rashmi Prasad

Dynamic Resource Allocation Scheme for 5G Networks of Fronthaul-Limited Shared Radio Units..... 158
Yun Wen, Takaharu Kobayashi, Teppei Oyama, Takashi Seyama, Takashi Dateki

Interference Analysis for Spectrum Sharing of Multiple Local 5G gNBs by Different Operators in a Building..... 164
Homare Murakami, Hirokazu Sawada, Takeshi Matsumura

Network Tool for Hybrid Analysis with External and Internal Scanning for Vulnerability Assessment of Network Nodes..... 170
Liubomir Nenov, Ivan Zlatanov, Agata Manolova

Generation of Precision Reference Clocks Utilizing Digital Techniques..... 175
Fred Harris, Uma S Jha

Open-Source Enabled Beyond 5G Private Mobile Networks: from Concept to Prototype 181
Razvan Mihai, Razvan Craciunescu, Alexandru Martian, Frank Y. Li, Cristian Patachia, Marius-Constantin Vochin

Internet Connected Open-Source Based 4G MIMO and 5G NSA Systems: Prototyping and Performance..... 187
Jon Anders S. Øgaard, Frank Y. Li, Geir Jevne, Kjetil Kjellstadli, Alexandru Martian

Enabling Pseudo-Orthogonal Preambles, Clustering, and MIMO in Massive IoT Networks 193
Carmen Florea, Razvan Craciunescu, Frank Y. Li, Alexandru Vulpe, Marius-Constantin Vochin

Development and Initial Implementation of Large-Scale Wireless Emulator Toward Beyond 5G 199
Takeshi Matsumura, Hirokazu Sawada, Toshiyuki Miyachi, Fumihide Kojima, Hiroaki Harai, Ayaka Sakaguchi, Yoshihisa Nishigori, Hiroshi Harada

Dynamic Offloading the SDN Control Plane in Large Area Networks by Condition-Aware Migration of Forwarding Devices 205
Pantelimon-Teodor Tivig, Eugen Borcoci, Marius Vochin

Received Path Power Prediction for Millimeter-Wave Using LSTM Under Indoor Environments 211
Takato Yamazaki, Kohei Ohno

Low-Complexity Quantum Channel Phase Estimation 216
Austin Bristow, Kwang-Cheng Chen

Genetic Algorithm Based Channel Pattern Selection for Spatial Modulation Using Slots of Leaky Coaxial Cable 221
Kenta Nagayama, Erika Kouda, Junjie Zhu, Yafei Hou, Satoshi Denno

On Numerical Robustness of Bi-Quad Structures Using Fixed-Point Approximate Multiplication..... 226
Peter Koch, Jan ?stergaard, Ove Andersen

Power-Efficient Joint Resource Allocation and Decoding Error Probability for Multiuser Downlink MISO with Finite Block Length Codes 232
Jalal Jalali, Atefeh Rezaei, Ata Khalili, Jeroen Famaey

A Combination of Successive Interference Cancellation and Repetition for UL-NOMA Systems 238
Masafumi Moriyama, Masahiro Yamazoe, Takashi Matsuda, Takeshi Matsumura

UAV Deployment for MU-MIMO Capacity Maximization in UAV-assisted Cellular Networks with Millimeter-wave Beamforming 244
Shunsuke Fujio, Kazuyuki Ozaki

Challenges for Volumetric Measurements Toward Radio Environment Map Construction for UAV Communications..... 250
Antoni Ivanov, Bilal Muhammad, Krasimir Tonchev, Albena Mihovska, Vladimir Poulkov

Positioning Performance of LEO Mega Constellations in Deep Urban Canyon Environments..... 256
Harshal More, Ernestina Cianca, Mauro De Sanctis

Efficient Antenna Tracking Algorithm for HAPS Ground Station in Millimeter-Wave 261
Go Otsuru, Hiroyuki Tsuji, Ryu Miura, Jun Suzuki, Yoshihisa Kishiyama

Urban Air Mobility: Insights into Potentials and Challenges 267
Luc Fynn Krull, Bilal Muhammad

Robustness of Quantum Key Distribution Against Quantum Phase Error and a New Attack Strategy 273
Austin Bristow, Kwang-Cheng Chen

Security Assessment of Android-Based Mobile Terminals 279
Zhiyuan Hu, Linghang Shi, Huijun Chen, Chao Li, Jinghui Lu

5G Attacks and Countermeasures 285
Sebastian Angelo Bjerre, Mikkel W?idemann Klæbel Blomsterberg, Birger Andersen

Bayesian Neural Networks for 6G CONASENSE Services 291
Paulo Sergio Rufino Henrique, Ramjee Prasad

Design & Development of Deep Learning Algorithm with Convolutional Neural Networks for Breast Cancer Classification 297
Rajesh Singh, Ragini Mishra

Data Sharing and Electronic Medical Record Privacy Protection of Out-Patient-Department Using Blockchain 303
Pradorn Sureephong, Pradya Komanee, Chanatip Trongpanyachot

Popliteal Height Estimation in French Elderly People for an Ergonomic Seat Height Design 308
Saad Eldine Noamani, Racha Soubra, Aly Chkeir

Food Waste Quantification; Methods and Benefits 312
Sadia Anwar, Muhammad Shahbaz, Aamir Saeed, Ramjee Parsad

An Improved Genetic Algorithm-Based Routing Protocol for Multimedia Data Transmission 317
Fozia Hanif, Rehan Shams, Samia Masood Awan, Muhammad Amir

Application and Challenges of an IoT Bird Repeller System as a Result of Bird Behavior 323
Suwannee Phetyawa, Chayapol Kamyod, Thongchai Yooyatiwong, Cheong Ghil Kim

Coffee Product Reservation and Plantation Report System to Improve Value Chain for Arabica Producers 328
Suepphong Chernbumroong, Pradorn Sureephong, Pitchatada Inkaew

Convolutional Neural Network and Dropout Technique for Recognition of Thai Food Image 332
Niti Natephakdee, Supansa Chaising, Punnarumol Temdee

Online Problem-Based Learning Framework for Promoting Digital Service Skills: Empirical Study of Local Entrepreneurs in Chiang Rai Province 336
Santichai Wicha, Annop Thananchana, Damrongpol Kamhangwong, Punnarumol Temdee

Employee Happiness Measurement System on Assigned Task in Agile Process 341
Yootthapong Tongpaeng, Pradorn Sureephong, Piraya Wadwongyod

Comparison of Cm- and mm-Wave Channel Characteristics Between Autonomous Mobile Robots in a Small I4.0 Manufacturing Facility 345
Troels B. S?rensen, Rasmus L. Bruun, Rene D. Marcker, Preben E. Mogensen

Scheduling of Smart Meter Data Access Using Hungarian Algorithm 351
Asma Farooq, Kamal Shahid, Rasmus L?venstein Olsen

Fine Time Measurement Based Synchronization for Industrial Wireless/Wired Networks 357
Sugandh Huthanahally Mohan, Rute C. Sofia

Hybrid SUN-LoRa Network on a Low Altitude Platform for Remote Water Quality Monitoring 363
Azril Haniz, Takeshi Matsumura, Haider A. H. Alobaidy, Mehran Behjati, Rosdiadee Nordin, Nor Fadzilah Abdullah, J. S. Mandeep, Nordin Ramli

Evaluation of Human Performance in Driving Scenarios 369
Anamaria Dumitrescu, Razvan Craciunescu, Alexandru Vulpe

Object Detection in Autonomous Vehicles 375
Razvan-Alexandru Bratulescu, Robert-Ionut Vatasoiu, George Sucic, Sorina-Andreea Mitroi, Marius-Constantin Vochin, Mari-Anais Sachian

Building an Open Source Containerized 5G SA Network Through Docker and Kubernetes 381
Larisa-Mihaela Tufeanu, Alexandru Martian, Marius-Constantin Vochin, Constantin-Laurentiu Paraschiv, Frank Y. Li

Deploying Use Case Specific Network Slices Using an OSM Automation Platform 387
Cosmin Contu, Andra Ciobanu, Eugen Borcoci, Marius-Constantin Vochin, Indika A. M. Balapuwaduge, Silviu Topoloi, Razvan-Florentin Trifan

Learning Graph Convolutional Neural Networks to Predict Radio Environment Maps 392
Krasimir Tonchev, Antoni Ivanov, Nikolay Neshov, Agata Manolova, Vladimir Poulkov

Sparse Code Multiple Access System Channel Estimation by Steepest Descent for 5G Uplink 396
Chung-Lun Hsu, Jun-Da Chen

Investigation of Beyond 5G-Based Physical Radio Node Emulation for Large-scale Wireless Emulator 400
Takeshi Matsumura, Hirokazu Sawada

Power Amplifier Linearization Using Orthogonal Polynomial Identified in Frequency Domain 406
Michiharu Nakamura, Keiichi Mizutani, Hiroshi Harada, Takeshi Matsumura

UAV Communication Aided by Intelligent Reflective Surfaces- a Performance Analysis in the Context of Industry 4.0 412
Asim Ui Haq, Bilal Muhammad, Albena Mihovska

Vehicle API and Service Catalog for Next Generation Mobility 418
Stefan Aust

Understanding Sustainable, Green and Circular Business Model Definitions and Configurations: Exploring the Fuzziness of Sustainable, Green, and Circular Business Models 424
Mirielle Torgersen, Per Valter, Peter Lindgrend, Gunnar Andersson

LiDAR Translation Based on Empirical Approach Between Sunny and Foggy for Driving Simulation 430
Jinho Lee, Daiki Shiotsuka, Toshiaki Nishimori, Kenta Nakao, Shunsuke Kamijo

Closing the Security Gaps in SOME/IP Through Implementation of a Host-Based Intrusion Detection System 436
Andreas Casparsen, Daniel Greth S?rensen, Jeppe Nellemann Andersen, Jonas Ingerslev Christensen, Panagiotis Antoniou, Rolf Kr?yer, Tatiana Madsen, Karsten Gjoerup

The Effect of Coupling on Antenna Array Beamforming at Millimeter-Wave Frequencies 442
Pablo H. Zapata Cano, Zaharias D. Zaharis, Haya Al-Kassir, Ioannis Mallioras, Pavlos Lazaridis, Traianos V. Yioultsis, Nikolaos V. Kantartzis

Log Analysis for Anomaly Prediction in Ground Segment Space Systems 447
Hristijan Petreski, Paschalis Veskos, Rui Santos, Eleni Psaroudaki, Ramjee Prasad

Standardization of Third-Party Data in Electronic Health Records 453
Ana Koren, Ramjee Prasad

Towards Efficient and Secure Framework for Devices and Informatics for Internet of Medical Things 459
Ragini Mishra, Ramjee Prasad

Improving Frequency Estimation Via Sequential Bayesian Filtering with Firefly Algorithm 464
Nattapol Aunsri

Distributed Control Scheme for Solar-Powered Serial Water Pumps Based on Hidden Markov Model 470
Roungsan Chaisricharoen, Wanus Srimaharaj

An End-To-End LoRaWAN-based IoT Platform with Built-in Network Coverage Testing Capability 474
Ana-Maria Dragulinescu, Ioana Marcu, Ciprian Zamfirescu

Deep Learning Approaches for Spectrum Sensing in Cognitive Radio Networks 480
Sadaf Nazneen Syed, Pavlos I. Lazaridis, Faheem A. Khan, Qasim Zeeshan Ahmed, Maryam Hafeez, Violeta Holmes, Ioannis P. Chochliouros, Zaharias D. Zaharis

Deep Learning Approach for Optimal Angle-Of-Arrival Estimation Using a mm-Wave Sensor 486
Bisma Amjad, Qasim Z. Ahmed, Pavlos Lazaridis, Zaharias D. Zaharis, Faheem A. Khan, Maryam Hafeez

QoE-Oriented Open Radio Access Networks for Virtual Reality Applications 491
Georgios Kougioumzidis, Atanas Vlahov, Vladimir Poulkov, Zaharias Zaharis, Pavlos Lazaridis

Patch Antenna Design Using Artificial Intelligence Methods for 4G/5G Applications 497
Lazaros Alexios Iliadis, Zaharias D. Zaharis, Sotirios P. Sotiroudis, Panagiotis Sarigiannidis, Christos Christodoulou, Sotirios K. Goudos

RF Propagation and Interferences Challenges for UAVs Swarm Detection and Positioning 501
Octavian Fratu, Ahmed M. Nor, Simona Halunga, Zaharias D. Zaharis

Different Indoor Localisation Techniques Using Smartphones 505
Samuel George Leitch, Waqas Bin Abbas, Qasim Zeeshan Ahmed, Maryam Hafeez, Pavlos I. Lazaridis

RFID Based IoT Sensor Communication System with ESPAR Antenna 510
Md. Moklesur Rahman, Heung-Gyoon Ryu

Network-Independent Clock Offset Estimation Using Correlated Sensor Data 514
Adham Taha, Mathias Thorsager, Sune Kr?yer, Tatiana Madsen, Hans-Peter Schwefel

An Improved Q-Learning Based Handover Scheme in Cellular-Connected UAV Network 520
Jihai Zhong, Li Zhang, Jonathan Serugunda, Prabhat Raj Gautam, Sheila Mugala

From Green Business Models to Green Symbiosis Business Value Network 526
Emma Ek, Per Valter, Peter Lindgren

3D Human Body Models Compression and Decompression Algorithm Based on Graph Convolutional Networks for Holographic Communication 532
Ivaylo Bozhilov, Krasimir Tonchev, Agata Manolova, Radostina Petkova

Holographic Telepresence in Knowledge Transfer - Potential and Challenges in the Implementation 538
Yana Tsankova, Agata Manolova

Business Opportunities for Beyond 5G and 6G Networks 543
Nidhi, Albena Mihovska, Ambuj Kumar, Ramjee Prasad

Data-Driven Interactive Crowd Management Systems for Metaverse Scenarios 549
Dessislava Koshnicharova, Nidhi, Albena Mihovska, Pavlina Koleva, Vladimir Poulkov

Author Index