Special Issue: Technological Advancements in Wireless and Optical Communication Systems

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Published online: 13 May 2019

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This special issue is mainly composed of the extended versions of selected papers presented at the Second “Global Conference on Wireless and Optical Communications” (GCWOC’17), September 18–20, 2017, Malaga, Spain. GCWOC’17 was jointly organized by University of Malaga (UMA) Spain, Mehran University of Engineering and Technology (MUET), Jamshoro, Pakistan and Sir Syed University of Engineering and Technology (SSUET) Karachi.

Furthermore, the issue also includes selected papers following the call for submissions of original research papers, both theoretical and practice-oriented, from academia, industrial professionals and students from relevant engineering fields with focus on Advancements in Wireless and Optical Communication Systems.

The first paper entitled “Design and Review of Water Management System Using Ethernet, Wi-Fi 802.11n, Modbus, and Other Communication Standards”. A water management Cyber Physical System (WM-CPS) is proposed by authors. This WM-CPS is Internet of Things (IoTs) based which is capable to control actuator via browser of internet and also we are capable to monitor reading of sensors from web based user interface. However, the current work is limited to demonstrating the use of flow sensor and actuators (pump, relay).

Second paper addresses the problem of synchronous speed in the network connected DC motors is presented by utilizing the Linear Quadratic Regulator (LQR) control along

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with the consensus algorithm of the leader following multi-agent system (MAS). It is entitled “Network Based Speed Synchronization Control in the Brush DC Motors via LQR and Multi-agent Consensus Scheme”. The simulation results endorse the effectivity of the proposed methodology by providing a complete insight of leader following multi-motors system, rotating in synchronization as that of leader.

Third paper is titled as “Interactive Physiotherapy: An Application Based on Virtual Reality and Bio-feedback”. This paper proposes an entertaining way to perform routine exercises, which do not require physical intervention, by packaging them into a Virtual Reality (VR) game environment for such patients to enhance joint and muscle mobility and also providing continuous monitoring of vital signs using Bio-sensors.

The fourth paper entitled “Smart Lightning Detection System for Smart-City Infrastructure Using Artificial Neural Network”. In this work, artificial neural network is applied for automatic building detection process for the application of smart-city infrastructure, which has drawn very little attention of researchers due to unavailability of standard data sets and well-defined approach. Object detection follows the lightning strike pattern of the lightning flashes on different air terminals installed on multi-geometrical scaled structures.

In the fifth paper, the authors have developed optical signal restoration technique for 100 Gb/s degraded signal for 400 km transmission distance. The proposed technique is designed using 2R and PSA. The benefit for using 2R with PSA is that 2R (Re-amplify Regenerate) the signal, while PSA is used to mitigate the amplitude and phase noises respectively. The paper is entitled “Design and Implementation of Optical Signal Rein-statement Technique for High DPSK RZ Transceiver Scheme”. The developed technique is implemented for DPSK-RZ Transceiver System and offers the BER of 10⁻²¹ and noise mitigation of more than 90% for DPSK-RZ Transceiver System.

The sixth paper proposes highly compact and high speed hardware architectures of 64-bit KASUMI block cipher for wide range of wireless applications. A novel methodology is adopted for low area KASUMI implementation employing a single Combined Substitution Block (CSB) for S9 and S7 substitution functions in FI/FO function. The title of paper is “Compact and High Speed Architectures of KASUMI Block Cipher”.

The seventh paper entitled “UAV Based Data Gathering in Wireless Sensor Networks”. In this paper, the problem of data gathering from a WSN with altitude controlled UAV is addressed. Simulation results verify the effectiveness of the proposed method. The proposed method verifies that when UAV achieve the desired height and its speed becomes constant, the data delivery becomes steady and the possibility of data drop out is decreased.

The eighth paper opens an avenue of green communication or energy-efficient communication. The paper entitled “Scaling of Output Load in Energy Efficient FIR Filter for Green Communication on Ultra-Scale FPGA”. Design of FIR filter with energy efficiency makes excellent sense to achieve energy efficiency in digital selected frequency module of communication.

The ninth paper entitled “Effects of Modulation Scheme on Experimental Setup of RGB LEDs Based Underwater Optical Communication”. The experimental results reveal that the blue color LED has best received signal strength in comparison to the green and red LEDs in underwater medium. All three LEDs achieve a bit error rate of around 10⁻⁵ with blue LED achieving highest SNR of 22.5 dB.

The tenth paper proposes hybrid anomaly detection method for Misdirection and Black-hole attacks by employing K-Mediod customized clustering technique. A synthetic dataset was established by defining network parameters and threshold values were obtained to detect the anomalies. Experimental work was performed on Network Simulator (NS-2) and R studio. The paper entitled “Hybrid Anomaly Detection by Using Clustering for Wireless

Sensor Network”. The proposed algorithm successfully detect the hybrid anomalies with high accuracy. This work is suitable for hybrid anomaly detection including Misdirection and Blackhole attacks in wireless environment.

The eleventh paper titled “3D Multilayer Mesh NoC Communication and FPGA Synthesis”. The research article presents the network on chip (NoC) architecture for flexible and scalable design under 3D mesh topological structure. The design is considered for 8 layers as multi-layered architecture. In one layer 64 nodes can communicate with each other. The performance of the design is analyzed with hardware parameters and timing utilization parameters on Virtex 5 FPGA.

The 12th paper presents the designing of a low voltage low power single ended operational transconductance amplifier (OTA) for low frequency application. The designed OTA combines three different schemes i.e. current splitting, current cancellation and source degeneration technique. The paper titled “Low Voltage Low Power Single Ended Operational Transconductance Amplifier for Low Frequency Applications”.

The 13th paper entitled “Experimental Evaluation of Intelligent Transport System with VLC Vehicle-to-Vehicle Communication”. This paper demonstrates the experimental implementation of VLC technology in the vehicle to vehicle communication for upcoming intelligent transport system (ITS). The prototype design is implemented in vehicles to avoid accidents where drivers alerted through warning messages.

The 14th paper focuses on the channel environment estimation for a frequency selective fast fading multipath channel under high mobility conditions (350 km/h) using 64-QAM modulation scheme for both normal and extended CP modes with a realistic 3GPP-EVA LTE downlink channel. The title is “Fast-Fading Channel Environment Estimation Using Linear Minimum Mean Squares Error-Support Vector Regression”.

The 15th Paper entitled is “Design and Analysis of Single-Bit Ternary Matched Filter”. In this paper a single-bit ternary matched filter has been designed. Evaluation of the filter’s frequency response is done with different oversampling ratios and filter orders.

In the 16th paper, the performance of WIMAX using the designed OFDM Transmitter for Non Cyclic Prefix, for Single Cyclic Prefix, and for Double Cyclic Prefix is demonstrated for 16, and 64 QAM, QPSK and BPSK. In conclusion, BPSK consumes less energy and bandwidth, but has low data rates for WIMAX systems. The paper entitled “Design of Cyclic Prefix Characteristic-Based OFDM System for WiMAX Technology”.

The 17th paper entitled “Monitoring, Control and Energy Management of Smart Grid System via WSN Technology Through SCADA Applications”. This research proposes a new architecture for efficient monitoring, control and proper energy management of smart grid system. The architecture is evolved by taking into account the SCADA system in-conjunction with WSNs as sensor nodes.

The 18th paper proposes a novel knowledge-based stuck-at fault analyzer that scans in-use data bundle for abnormal patterns of sensory column values. The proposed approach stores scanned error dataset into HBase repository and performs prediction analysis for training and evaluating in-use stuck-at data blocks in smart meters. The title of paper is “Stuck-at Fault Analytics of IoT Devices Using Knowledge-based Data Processing Strategy in Smart Grid”.

In the 19th paper, the authors have estimated the amount of energy consumed in different phases of dynamic cluster based WSNs. The parameters used for this analysis were percentages of CHs, networks area sizes and number of nodes in the network. It was discovered through extensive simulations that cluster setup phase consume around 21% of the total network energy due to the broadcasts of control packets. The paper entitled “Energy Conservation Using RR Algorithm in Dynamic Cluster Based WSN”.

The 20th paper entitled “Impact of Front-Haul Delays in Non-ideal Cloud Radio Access Networks”. This paper has analyzed the impact of HARQ report delay on the user throughput under centralized and MAC splitting conditions. In order to clarify the understanding of the trade-off between report delay and user throughput, a new metric named as Net Rate (NR) has been proposed.

In the 21st paper, an experimental environment has been created by developing and implementing an android based application. This application implements selected encryption algorithm on selected file and store encrypted contents on local storage. The title of paper is “Energy Efficient Data Encryption Techniques in Smartphones”.

The 22nd paper entitled “ECG-Signal Based Secret Key Generation (ESKG) Scheme for WBAN and Hardware Implementation”. In this research work, secret key generation scheme has been presented and implemented on an existing cryptographic algorithm to achieve a cryptographic solution for Wireless Body Area Sensor Nodes (WBASN) pace-makers. This is theoretically a secure information transfer method for In-body sensors. The proposed scheme uses ECG signal (physiological) based secret key (64 bits) generation for encryption of the secure data measured from the In-body WBASN before transmission.

In the 23rd paper, the key objective is to build a theoretical basis to analyze the problem of routing in MANETs. In this paper we focus on dynamic queuing method. This method is used to distribute the load among the node based on least buffer size. The consequence of buffering in the network at the channel is based on the end-to-end delay routine. The title of paper is “Design of a Buffer Enabled Ad hoc On-demand Multipath Distance Vector Routing Protocol for Improving Throughput in Mobile Ad hoc Networks”.

The 24th paper entitled “Design Optimization of EDFA for 16×10 Gbps Data Rate DWDM System Using Different Pumping Configurations”. In this paper, the Erbium Doped Fiber Amplifier (EDFA) is used as a booster and a pre-amplifier in the Dense Wavelength Division Multiplexing (DWDM) system. The design parameters of the EDFA have been optimized using the Multi-Parameter Optimization (MPO) tools.

In the 25th paper, two power estimation models are introduced to estimate the power of FPGA implementations. The power and error variations of both the models are analyzed against Xpower Analyser for 20 different digital circuits. The paper entitled “Heuristic and Statistical Power Estimation Model for FPGA Based Wireless Systems”.

The 26th paper presents derivation of closed form expressions for the distribution of per user SNR and system output SNR for a PF algorithm based on a transmission rate criterion. Afterwards, these expressions were used to compare its performance with the SNR-based PF presented in most of previous works. The title of paper is “SNR-Versus Rate-Based Proportional Fair Scheduling in Rayleigh Fading Channels”.

In 27th paper, the real-time adaptive noise canceller (ANC) system is implemented using modified sigmoid function (MSF) variation based Recursive Least Square with Variable Forgetting Factor (MSFRLSVFF) algorithm. The experiment is performed on DSP TMS320C6713. The performance of MSFRLS-VFF algorithm is evaluated and comparison is made with conventional RLS and Affine Projection Algorithm (APA). The paper entitled “Performance Analysis of MSFRLS-VFF Based Real-Time Adaptive Noise Canceller with RLS and APA Algorithms Using TMS320C6713 Processor”.

The 28th paper entitled “Visual Speech Recognition Using Optical Flow and Hidden Markov Model”. This work proposes Audio-visual speech recognition (AVSR) with the use of Gamma tone frequency cepstral coefficient (GFCC) and Optical flow (OF) features with Hindi speech database. The OF refers to the distribution of apparent velocities of brightness pattern movements in an image.

The 29th paper presented a detailed numerical investigation of the effects of optical feedback on the dynamics of a semiconductor laser. Addressing the issue of distributed optical feedback, optical feedback produced by multiple external mirrors has been studied. The title of paper is “Semiconductor Laser in Distributed Optical Feedback Regime”.

In the 30th paper, a wireless brain-computer interface is proposed to control the smart home and medical devices. The wireless acquisition of EEG signal is achieved using a commercially available EEG headset that has an embedded TGAM module inside headset, which calculates the attention, meditation and detects blinks. This system can manipulate EEG signals without sending them to back-end computers and allows monitoring the data on a smartphone. The paper entitled “Wireless Brain Computer Interface for Smart Home and Medical System”.

The 31st paper entitled “Probabilistic Hierarchical Model Using First Person Vision for Scenario Recognition”. In this work, a method for scenario recognition using the objects seen is proposed. The authors generated probabilistic models to interpret complete scenarios, which conceptually are actually a collection of multiple activities and objects.

The 32nd Paper proposes an adaptive power control strategy for conserving energy in MWSN. The proposed scheme uses variable transmission power to reduce energy usage in the transmission of data and control packets and estimates the energy consumed in unicast and broadcast communication of data and control packets. The paper entitled “Adaptive Power Control Scheme for Mobile Wireless Sensor Networks”.

The 33rd paper entitled “Analysis of Coverage and Binary Rate in a Hybrid/Full Duplex Heterogeneous Cellular Network under Various Association Criteria”. In this paper, a Hybrid duplex (H) two tier Heterogeneous Cellular Network (HCN) is considered: Small pico Base Stations (BSs) use full duplex mode while macro BSs run usual Half Duplex (HD) transmission to avoid high interference. Different duplexing modes and association criteria are analysed and their performance compared in terms of coverage, binary rate and Energy Efficiency (EE).

The 34th paper proposes Wireless IoT Edge-enabled Block Replica Strategy (WIE-BRS), which stores block replicas onto in-place, partition-based and multi-homing network based storage media and perform the aggregate MapReduce job in respectively. The paper entitled “An Aggregate MapReduce Data Block Placement Strategy for Wireless IoT Edge Nodes in Smart Grid”.

The 35th paper entitled “More Precise FPGA Power Estimation and Validation Tool (FPEV_Tool) for Low Power Applications”. This paper provides a significant approach for designing the more accurate power estimation and validation models over the existing power estimation models given in the literature. It is well established that one of the existing power estimation models is not able to accurately estimate the power of the designs incorporated with low power techniques like clock enable.

In the 36th paper, the error rate performance is scrutinized for orthogonal frequency division multiplexing (OFDM) based FSO system with 16-QAM modulation, and the effect of several atmospheric turbulence conditions has been analyzed. The title of paper is “Concatenated LDPC-TCM Codes for Better Performance of OFDM-FSO System Using Gamma-Gamma Fading Model”.

The 37th paper entitled “PSOBLAP: Particle Swarm Optimization-Based Bandwidth and Link Availability Prediction Algorithm for Multipath Routing in Mobile Ad Hoc Networks”. In this paper, the particle swarm optimization based on available bandwidth and Link quality based on mobility Prediction algorithm is used to provide the multipath routing in MANET.

In the 38th paper, the authors have reviewed the sinkhole attacks on WSNs. We have covered the discussion on the most popular WSN routing protocols and the techniques adversaries used to launch a sinkhole attack on them. The critical observations had been paid on intruder detection mechanisms and reviewed various techniques proposed in the literature to detect sinkholes. The paper entitled “Sinkhole Attacks in Wireless Sensor Networks: A Survey”.

The 39th paper entitled “Integrated Blind Signal Separation and Neural Network Based Energy Detector Architecture”. In this work a new coherent energy detector system architecture is proposed that first separates the signal components from a noisy signals (non-Gaussian noise) at SU receiver, then from the separated signals it estimates the signal attributes [power of the signal, noise variance, signal-to-noise ratio (SNR)] required for conventional energy detector.

The 40th paper addresses analysis of performance, complexity and effectiveness of various Massive MIMO (M-MIMO) detectors operating under highly spatial correlated uniform planar arrays (UPA) channels. The paper entitled “Low-Complexity Massive MIMO Detectors Under Spatial Correlation and Channel Error Estimates”.

The 41st paper entitled “A Novel Nonlinear and Non-iterative Precoding Technique for Single and Multi-User MIMO Systems”. In this work, a modification of the well-known linear and iterative based pre-coder intended for both single and multi-user (MU) multiple-input multiple output (MIMO) has been proposed. The proposed pre-coder uses the nonlinear and non-iterative processing strategies to obtain more efficient and less complex designs.

In the 42nd paper, authors have proposed a new pulse shaping window called Modified Raised Cosine Power (MRCP) pulse for N-subcarriers orthogonal frequency division multiplexing (OFDM) systems that suppresses out-of-band (OOB) radiation and reduces peak to average power ratio (PAPR). The paper entitled “Performance Enhancement of 5G OFDM Systems Using Modified Raised Cosine Power Pulse”.

The 43rd paper entitled “Crowdsourced Based Vehicle Tracking System”. In this research, the authors have proposed the tracking of vehicles which uses crowdsourced positioning data obtained from GPS of smartphones. Traditional transit tracking is costly and resources limited, thus instead installing a tracking device in each vehicle, the location of each vehicle is tracked by user’s smartphone.

The 44th paper describes a road monitoring system using crowdsourcing approach to locate potholes and speed breakers. The continuous monitoring of the real time road anomalies allows acceptable infrastructure maintenance and management operation. The paper entitled “Threshold Based Efficient Road Monitoring System Using Crowdsourcing Approach”.

The 45th paper entitled “Performance Analysis of MultiACK-SFAMA for Underwater Acoustic Networks”. In this paper, the authors have presented performance analysis of MultiACK-SFAMA as a function of transmission range, number of nodes and BER. The study involved enhancing the throughput of S-FAMA MAC protocol for underwater acoustic networks using MultiACK mechanism. Throughput equations were derived and used to plot and analyze the throughput curves.

It is note that one of the paper entitled “Combined Blockiness, Blurriness and White Noise Distortion Meter” presented in the conference got published in December 2018, Volume 103, Issue 3, pp 1927–1939. This work presents a unique less complex reduced reference, combined blockiness, blurriness and white noise image quality assessment meter (CWNQAM) in frequency domain. The proposed image quality estimation method requires fewer computational resources than conventional methods.

We would like to thank the Editor-in-chief (Professor Ramjee Prasad), Mr. Meertinus Faber (Project Coordinator of Production at Springer Nature) and Mr. Joseoh Ian Reyes (Springer's Journal's Editorial Office Assistant) for their support and help in realizing this special issue. Special thanks to all the authors for promptly revising their papers to meet the requirements of reviewers. Thanks to the all valued reviewers for contributing with their expert comments to improve selected papers. Hope you will have the benefit by reading this special issue.

Coordinating Guest Editor: Bhawani Shankar Chowdhry.

Guest Editors: Javier Poncela, Muhammad Aamir, Pablo Otero, Thomas Newe.

Professor Dr. Bhawani Shankar Chowdhry is the Distinguished National Professor and former Dean Faculty of Electrical Electronics and Computer Engineering, Mehran University of Engineering and Technology (MUET), Jamshoro, Pakistan. He has the honour of being one of the editor of several books "Wireless Networks, Information Processing and Systems", CCIS 20, "Emerging Trends and Applications in Information Communication Technologies", CCIS 281, "Wireless Sensor Networks for Developing Countries", CCIS 366, "Communication Technologies, Information Security and Sustainable Development", CCIS 414, published by Springer Verlag, Germany. He has also been serving as a Guest Editor for "Wireless Personal Communications" which is Springer International Journal. He has produced more than dozen PhDs and supervised more than 50 MPhil/Masters Thesis in the area of ICT. His list of research publication crosses to over 60 in national and international journals, IEEE and ACM proceedings. Also,

he has Chaired Technical Sessions in USA, UK, China, UAE, Italy, Sweden, Finland, Switzerland, Pakistan, Denmark, and Belgium. He is member of various professional bodies including: Chairman IEEE Communication Society (COMSOC), Karachi Chapter, Region10 Asia/Pacific, Fellow IEP, Fellow IEEEP, Senior Member, IEEE Inc. (USA), SM ACM Inc. (USA). He is lead person at MUET of several EU funded Erasmus Mundus Program including "Mobility for Life", "StrongTies", "INTACT", and "LEADERS". He has organized and co-organized several International Conferences including "IMTIC08", "IMTIC12", "IMTIC13", "IMTIC15", "IMTIC18", "WSN4DC13", "IEEE SCONEST", "IEEE PSGWC13", "GCWOC15", "GCWOC16", "GCWOC17" and track chair in "Global Wireless Summit (GWS 2014)".

Javier Poncela received the M.Sc. degree in Telecommunications Engineering from the Polytechnic University of Madrid, Spain, in 1994 and the Ph.D. degree from the University of Málaga, Spain. He also holds a MBA degree. Dr. Poncela worked in Alcatel Spacio before joining the University of Málaga in 1995, where he is currently Associate Professor. He did his Ph.D. on methodologies for efficient development of complex communications systems. He has actively collaborated with multinational companies (Nokia, Cetecom GmbH, AT4wireless, Ingenia) on formal modeling and system testing in Bluetooth, 3G and satellite systems. Currently, his interests are in underwater communication networks, analysis of end-to-end performance, and models for the evaluation of QoE. Regarding technology transfer, he has participated in more than 20 R&D projects with the industry (contracts according to article 83 of the LOU). He has been Principal Investigator in four of

them, with both approaches for research and industrial application. Among the companies that he has collaborated with are Nokia (2000–2003), AT4 wireless (2000–2006), Airzone (2008–2009) and Ingenia (2012–2015) multinationals. He has co-authored more than 50 publications, 23 of them in JCR journals. He has been co-editor of special issues in journal Wireless Personal Communications. Dr. Poncela is also coordinator of the Communications Network group of courses (Undergrad and Masters) taught at the School of Telecommunications, having participated in such a role in the development of existing curricula. He has been coordinator of Master on Telematics and Communication Networks for 6 years and since 2012 serves as Deputy Dean for International Relations in ETSIT. He also coordinates international Mobility Programs

Erasmus + KA107 between University of Malaga and Universities in Pakistan and France. He is co-founder of the Applied Communications Engineering for underwater (ACEuw) R&D group.

Dr. Muhammad Aamir received MS degree in Electronic Engineering (with specialization in Telecommunication) in 2002 and BS in Electronics Engineering in 1998. He accomplished his Ph.D. in Electronic Engineering from Mehran University of Engineering and Technology. During his Ph.D. studies, he accomplished his research work at the University of Malaga under Erasmus Mundus Scholarship. He has authored and co-authored more than 50 research papers and book chapters published in various journals, books and conferences of international repute. He is a life member of Pakistan Engineering Council and professional member of IEEE for last 12 Years. He was also awarded with a grant by the Ministry of Education Spain to teach at the University of Malaga which he availed in May 2012. He is also Member of NCRC in the Higher Education Commission (HEC) for revision of Electronic Engineering Curriculum and Telecommunication Engineering Curriculum at the National Level. He is guest editor for special issue of Springer's Journal with title "Wireless Personal Communication" which had

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Dr. Pablo Otero received the Ingeniero de Telecomunicacion degree from the Polytechnic University of Madrid (UPM), Madrid, Spain, in 1983, and the Ph.D. degree in electrical engineering from the Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland, in 1998. From 1983 to 1993, he was with the Spanish companies Standard Electrica, E.N. Bazan, and Telefonica, where he was involved in communication and radar systems engineering. In 1993, he joined the University of Seville, Seville, Spain, where he lectured radio communications and radio wave propagation for 2 years. In 1996, he joined the Laboratory of Electromagnetism and Acoustics, EPFL, where he was a Research Associate, granted by the Spanish Government. In 1998, he joined the University of Malaga, Malaga, Spain, where he is currently an Associate Professor. His research interests include electromagnetic and antenna engineering and underwater acoustic communications.

Dr. Thomas Newe is a Senior Lecturer in Computer Engineering in the Department of Electronic and Computer Engineering at The University of Limerick. He is group leader of the IoT/WSN Security activities in the Optical Fibre Sensors Research Centre and the Centre for Robotics and Intelligent Systems. He holds a B.Eng. in Computer Engineering (1991), a Masters in Engineering in Security Protocol Design (1996) and a Ph.D. in Formal Logics for Security Protocol Verification (2003). He has been a University of Limerick faculty member since 1994. His research interest include: Wireless Sensor Systems and Networks, Security protocol design for Data and the Cloud, Network Security, Security protocol formal verification methods, Cryptography/Encryption algorithms, Embedded system programming, Digital design, Programming languages, Operating systems, Smart cards security protocols, Digital Watermarking and Watermark Benchmarking tools. He has graduated a number of Ph.D. students in the broad area of network security. His stu-

dents are funded from a variety of sources including: EU, SFI, IRC, Internationally and industrially funded.