Foreword by Guest Editors for the Special Issue on the 2016 Global Conference on Wireless and Optical Communications (GCWOC'16)

**Bhawani Shankar Chowdhry¹ · Javier Poncela² ·
Thomas Neue³ · Pablo Otero² · Muhammad Aamir⁴**

Published online: 29 November 2016
© Springer Science+Business Media New York 2016

Welcome to this special issue of Wireless Personal Communications. This special issue comprises a selection of best papers from the Global Conference on Wireless and Optical Communications (GCWOC'16). This 3-day event provided a platform for researchers from Europe, Asia and other parts of the world to exchange ideas, innovations and challenges encountered throughout the research process in these areas.

This issue has been organized in two main blocks, placing papers related to wireless communications in the first block; the second block contains those papers whose scope is optical communications. Within each block, papers have been arranged taking into account the layer they are more related to, from bottom to top. A few of papers outside these scopes are included at the end.

The GCWOC conference was held at the University of Malaga, Spain, during 5–7 September 2016, and was jointly organized by the University of Malaga (Spain), the Mehran University of Engineering and Technology (Pakistan), and the Sir Syed University of Engineering and Technology (Pakistan).

The first paper is entitled “An Efficient Method for Investigating and Optimizing Near Field Characteristics of Planar Antenna Arrays”. The author analyzes the near field of 2D planar antenna arrays with an analytical method, instead of using numerical methods, which are time consuming. The results show that the use of asymmetrical amplitude weighting coefficients, together with Chebyshev far-field technique, improves the side lobe suppression.

Coordinating Guest Editor: Bhawani Shankar Chowdhry.
Guest Editors: Javier Poncela, Thomas Neue, Pablo Otero, Muhammad Aamir.

✉ Bhawani Shankar Chowdhry
c.bhawani@ieee.org

¹ Mehran University of Engineering and Technology, Jamshoro, Pakistan

² University of Málaga, Malaga, Spain

³ University of Limerick, Limerick, Ireland

⁴ Sir Syed University of Engineering & Technology, Karachi, Pakistan

The focus of the second paper are the heterogeneous cellular networks. It is entitled “Joint Uplink/Downlink Coverage and Spectral Efficiency in Heterogeneous Cellular Network”. Heterogeneous access networks are a quite active topic nowadays. The authors analyze a two-tier network, with base stations and user equipment uniformly distributed. The paper shows the results of coverage and spectral efficiency for marginal uplink and downlink, and for joint uplink/downlink. They also show that avoiding power control leads to higher symmetric spectral efficiency.

The third paper is titled “Bandwidth Allocation for Wireless Cellular Network by Using Genetic Algorithm”. The spectrum scarcity has been driving operators to deploy more intelligent and efficient allocation algorithms in their networks. The authors of this paper consider the use of genetic algorithms to improve current allocation schemes and maximize the quality of service (packet loss, delay and jitter). The experiment has been carried out over the IP cellular network. The proposed technique balances the call dropping probability throughout the connection.

The fourth paper is a survey on 5G. Its title is “Understanding 5G Wireless Cellular Network: Challenges, Emerging Research Directions and Enabling Technologies”. The authors discuss the requirements for 5G, enabling technologies such as carrier aggregation, network virtualization and massive MIMO.

The fifth paper is entitled “A Framework to Evaluate Fairness in Fractional Frequency Reuse Based cellular Networks”. This paper analyzes the Inter-cell Interference (ICI) in LTE-A systems. The authors propose a framework to analyze the fairness of scheduling techniques. The paper considers as scheduling policy schemes such as equal resource sharing, equal transmission rate, and truncated equal transmission rate. The results show the optimum value of the SINR and partition bandwidth for maximizing the spectral efficiency.

The sixth paper is titled “Dynamic Spectrum Allocation Scheme for Heterogeneous Network”. It discusses the use of femtocells in heterogeneous networks. The authors analyze how to decrease co-channel interference. The proposed scheme groups Nodes B before distributing the bandwidth. Authors suggest using idle subchannels in the licensed bands in MeNB and DB-TV networks with minimum fading effects. Simulation results are provided comparing the various scenarios.

The seventh paper addresses carrier frequency offset suppression for LTE networks. It is titled “Analysis of Carrier Frequency Offset Suppression Techniques in SC-FDMA Communication Systems”. This problem mainly arises from misalignment of the oscillator and the Doppler shift, and causes overall performance degradation due to inter carrier interference (ICI) and multi user interference (MUI). Authors discuss different techniques for achieving the offset suppression, such as feedback, inverse pilot matrix and linear parallel interference cancellation (LPIC).

The eighth paper is titled “Numerical Modeling of Human Tissues and Scattering Parameters for Microwave Cancer Imaging Systems”. It investigates the use of S parameters for the design of UWB transceivers for cancer detection in human breasts. The numerical modeling is carried out using the finite differences technique. Instead of considering the breast as composed of individual layers, the authors analyze it as a whole, and measure its channel impulse response. The paper includes results for scattering parameters for tissues of different thickness.

The ninth paper is titled “Analysis of Low Power Consumption Techniques on FPGA for Wireless Applications”. Low consumption devices are beginning to permeate our daily life whether we use them as portable devices or as IoT sensors and actuators. The authors explore here design techniques on FPGAs, and compare the power required in operation.

The tenth paper is titled “Low Power Synthesis and Validation of an Embedded Multiplier for FPGA based Wireless Communication Systems”. The consumption estimation of FPGAs in the early stages of the design is one requirement to avoid design pitfalls. However, current estimation models have some limitations. The authors analyze their accuracy for the study case of an embedded multiplier. Results are discussed for different lengths of the input/output vectors.

The eleventh paper continues with the topic of FPGAs. It is titled “Performance Evaluation of FIR Filter after Implementation on Different FPGA and SOC and Its Utilization in Communication and Network”. This paper analyzes the improvements by using 20 nm technology instead of 28 nm. The authors study the consumption and use of resources for FIR filters in different families of FPGAs.

The twelfth paper starts the series of papers above the physical layer. It is titled “Comparative Analysis of MAC Protocols and Strategies for Underwater Applications”. This paper discusses access control strategies in a quite unfriendly environment, such as the sea depths. The authors analyze the performance of several selected MAC protocols based on their achievable throughput. Improvements on one of these protocols are proposed and analyzed, showing that, at low cost, they may help saving energy in certain situations.

The thirteenth paper is titled “Clustering based Energy Efficient and Communication Protocol for Multiple Mix-zones over Road Networks”. One of the problems that on-road communications face is the variability of the nodes which can be used as relays of our transmissions. The authors present here a clustering protocol for chain scenario that allows connections with roadside units, V2V and V2I systems. The papers presents results obtained with the SUMO simulator for 10,000 vehicles randomly distributed. The results are compared with regards to the stability period and the energy variance.

The fourteenth paper is titled “Connectivity and Coverage based Grid-Cluster size Calculation in Wireless Sensor Networks”. The authors analyze the number of sensors that it is required to deploy to monitor one area. As the communication range for low cost wireless sensors usually is small, many sensors may be reporting measures which are indeed virtually the same. The authors analyze the features of grid size and make a comparative analysis of differently sized and shaped grid clusters in terms of efficiency, connectivity and required number of nodes.

The fifteenth paper is the first to discuss networking and application issues. It is titled “Location Fingerprinting Technique for WLAN Device-free Indoor Localization System”. The aim is to study the possibilities of RSSI fingerprinting for indoor localization. The authors describe an experimental setup within an office building, where several access points are deployed. The measurements show the RSSI variations due to human presence.

The last paper on wireless communications is titled “Design and Implementation of a Multihoming-based Scheme to Support Mobility Management in NEMO”. In a world with an increasing number of portable and embedded devices, this paper focuses on the issue of mobility management. The authors address the drawbacks of the NEMO BSP protocol, and propose a novel scheme which employs the multihoming technique. Comparison between both protocols is made via metrics such as handoff delay, packet loss and packet delivery ratio.

The seventeenth paper is titled “Towards Development of a Low Cost Early Fire Detection System using Wireless Sensor Network and Machine Vision”. This paper describes an application of low cost sensors to protect buildings, using vision processing, from hazards such as fire.

The eighteenth paper is titled “WSN Based Smart Control and Remote Field Monitoring of Pakistan’s Irrigation System Using SCADA Applications”. It addresses the use of sensors for agriculture monitoring. Improving the management of fields is required to obtain better crops at lower costs. Aside from biological enhancements, ICT technologies provide a wide range of opportunities to improve the status. The authors present the complexities of the Pakistan’s irrigation system, and propose a centralized controlled monitoring system that helps save water. They estimate that savings of up to 20% can be achieved.

The nineteenth paper is titled “Privacy Preserving Dynamic Pseudonym-based Multiple Mix-Zones Authentication Protocol over Road Networks”. Communication over road networks is about to be part of our communication infrastructure. However, concerns may arise about the security of these communications. The authors propose in this paper a dynamic authentication protocol to preserve privacy in these scenarios. The new mechanism requires users to register in a server for the dynamic change of pseudonym. The paper includes simulation results for the Real Northwest Atlanta region.

The twentieth paper begins the block on optical communications. It is titled “Development of New All-Optical Signal Regeneration Technique”. All-optical signal regeneration techniques look to decrease the bit error rate when power received is below -10 dBm. The authors propose a new technique by using phase sensitive amplification and an optical phase locked signal mechanism. DPSK signals have been used for testing, with links longer than 300 km. The results show improvement of the transmission of six digits in the bit error rate.

The twenty-first paper is titled “Self-Configured Free Space Optical System Transceiver Algorithm for Extreme Weather Conditions”. The authors analyze the simultaneous use of several transmitters and receivers under extreme weather in Malaysia and Pakistan. They propose a decision algorithm to select the most appropriate laser in each scenario.

The twenty-second paper also focuses on the analysis of optical communication links in terms of bit error rate. It is titled “Performance Evaluation of Atmospheric Optical Communications Links by Generalized Málaga Turbulence Model”. The optical scintillation is modeled as an M-distribution, and the atmospheric optical channel is treated as a superposition of a finite number of subchannels. In the paper, new analytical formalisms are proposed. The authors derive closed expressions for the bit error rate and the optical link as a whole.

The twenty-third paper is titled “Analyzing the Quality of Free Space Optical Signal in Fog a Case Study”. It addresses the performance of optical links under fog scenarios. The work simulates different fog events, using different fog attenuation models like Kruse, Kim and Al-Naboulsi. Attenuation and Q factor are the performance metrics evaluated.

The twenty-fourth paper is entitled “Demonstration of TWDM-PON Backward Compatibility with Conventional GPON”. Its focus is the backward compatibility of optical networks. In particular, between Time Wavelength Division Multiplexing PONs and conventional Gigabit PONs. A 2.5 Gbps link providing triple play services is evaluated for different modulation formats. The approach of the authors allows deployment flexibility with a ‘pay-as-you-grow’ scheme.

The twenty-fifth paper is entitled “Comparative Study and Packet Error Rate Analysis of Advance Modulation Schemes for Optical Wireless Communication Networks”. The choice of a modulation scheme is an essential decision in an optical wireless communications system. The authors here analyze advanced modulation schemes in terms of parameters such as transmission power, bandwidth requirement or packet correction rate.

They identify the best candidate for each metric. As a result, recommendations are made taking into account the type of network and the required information capacity.

The twenty-sixth paper closes the block on optical communications. It is entitled “An Improved Model to Predict the Temperature dependence of Refractive Index of InP-based Compounds”. Temperature variation causes losses due to the changes of the refractive index of the material. The authors show that existing models fail to match experimental data for InP/InGaAsP materials. Thus, an extended model is proposed for the modified single oscillator model. In particular, the authors analyze the introduction of a new term in the equations, which can cater for temperature variances.

The last three papers of this issue present a line of research in Pakistani universities that target remote and autonomous control. Two of these papers explore the possibilities of using the Microsoft Kinect sensor.

Paper twenty-seventh is titled “Kinect as a Generalised interface for Games and PC Control”. The authors develop an interface to substitute keyboard and mouse controls by gestures. They integrate the interface with three PC games of diverse type. The papers describe a set of gestures that has been designed to control these games. Authors show the recognition rates for each gesture for novel subjects.

The twenty-eight paper is titled “Kinect Controlled UGV”. It considers the Microsoft Kinect sensor as a means to control unmanned ground vehicles. The Kinect sensor is a quite powerful system for gesture processing, which the authors integrate to control the navigation of vehicles. Handicapped people are target users for this system.

The last paper of this issue is titled “Autonomous Air Hockey Robot”. The authors analyze here an automaton which can compete in the game using machine vision. The system uses the Kinect camera, which provides depth information, to sense the environment; an Arduino board estimates the puck trajectory and controls the sliders in the X–Y directions. The system itself can be configured to simulate human responses.

We would like to thank the Editor-in-chief (Professor Ramjee Prasad), Senior Editorial Assistant Springer Katherina Steinmetz and Springer’s Journals Editorial Office Jenilyn Jaos (Ms) 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.

Bhawani Shankar Chowdhry is the Dean Faculty of Electrical Electronics and Computer Engineering and former Director IICT at 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 Ph.Ds and supervised more than 50 M.Phil/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: Chair IEEE Karachi Section, Ex-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 several International Conferences including “IMTIC08”, “IMTIC12”, “IMTIC13”, “IMTIC15”, “WSN4DC13”, “IEEE SCONEST”, “IEEE PSGWC13”, and track chair in “Global Wireless Summit (GWS 2014).

Javier Ponce received the M.Sc. degree in telecommunication engineering from the Polytechnic University of Madrid, Spain, in 1994 and the Ph.D. degree from the University of Málaga, Spain. He worked in Alcatel Spacio before joining the University of Málaga at the Communication Engineering Department. He has actively collaborated with multinational companies (Nokia, AT4wireless, Ingenia) on formal modeling and system testing in Bluetooth, UMTS and satellite systems. His research interests include underwater communication systems, methodologies for efficient development of complex communications systems and analysis of QoS over heterogeneous networks.

Thomas Newe is a Senior Lecturer in Computer Engineering in the Department of Electronic and Computer Engineering at The University of Limerick. He holds a B.E. 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 students are funded from a variety of sources including: EU, SFI, IRC, Internationally and industrially funded.

Pablo Otero received the Ingeniero de Telecommunication 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 Elctrica, 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 two 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.

“Wireless Personal Communication” which had published in May 2015. He is also HEC approved supervisor for PhD candidates.

Muhammad Aamir was born in Karachi Pakistan, on July 3, 1976. He received MS degree in Electronic Engineering (with specialization in Telecommunication) in 2002 and BS in Electronics Engineering in 1998. He accomplished his PhD in Electronic Engineering from Mehran University of Engineering & Technology. During his PhD 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 published in various journals 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