

DESIGN AND IMPLEMENTATION OF DEVICES, CIRCUITS, AND SYSTEMS



Mohammad A. Matin



Vyasa Sai

Technological advancements for diverse applications have led to an increase in the design size and complexity of devices and circuits within communications systems, emphasizing the significance of the Design and Implementation of Devices, Circuits, and Systems Series. This series aims to provide insights into the issues, challenges, and requirements related to the design and implementation of future communication systems. In the last few decades, Information and communication technologies (ICT) have gone a long way, maintaining a consistent upward curve in providing smart environments for a wide range of applications. These technologies not only improve operational efficiency but also enabled users to interact with their surroundings in innovative ways. This November issue of the Design and Implementation of Devices, Circuits, and Systems Series features five articles that focus on the smart design and implementation of circuits and systems specific to wireless communications, highlighting better performance, smart applications, and sustainable future as primary goals along with providing rich insights into vital aspects of future communication systems.

The first article “Enabling Intelligent Omni-Surfaces in the Polarization Domain: Principles, Implementation and Applications” introduces the use of electromagnetic polarization in the design and operation of intelligent omni-surfaces (IOS) aided systems. The tight coupling between the transmission and reflection modes of the IOS is eliminated through the use of the polarization domain in this article and the modes become independent enabling advanced functionalities and enhanced coverage diagrams for the IOS-aided communications.

The next article “Environment-Adaptive Reconfigurable Intelligent Surface for Dynamic Channel Conditions,” discusses an advanced reconfigurable intelligent surface (RIS) that adapts to changing wireless conditions. Unlike conventional RIS, which relies largely on signal reflection, the introduced environment adaptive RIS optimizes itself based on the wireless environment through channel state information estimation for improved communication performance.

The third article, “Toward Metantennas: Metamaterial-based Antennas for Wireless Communications,” presents the application of metamaterial in antenna design to improve overall performance and efficiency of future wireless communication systems. This article also emphasizes the importance of Metantennas and its impact in 5G and 6G communications especially in enabling larger bandwidth, more efficient use of spectrum, and stronger signals to facilitate faster data transfer rates, and lower latency.

The fourth article “Design and Implementation of Visible Light Positioning Systems Based on Photodiode Array” offers a low-cost, accurate and easy-to-deploy framework of photodiode-based Visible Light Positioning (VLP) Systems. The described design strategy allows for a rapid development of VLP and assist-

ed communication systems in various settings, such as industrial, commercial, and domestic areas, enabling precise localization and pilot-free communications for people or devices that can be integrated in 6G mobile communication systems for smart city applications.

The last article “On the Potential of Using Emerging Microwave Links for Cities Rainfall Monitoring,” reviews the technology of commercial microwave backhaul links (CMLs) for smart city rainfall monitoring and its potential to become a low-cost and sustainable smart city application through real-time services to enhance the real-time rainfall monitoring network and help with forecasting floods and storms.

Since our last edition, we have added Jacopo Iannacci from the Fondazione Bruno Kessler, Italy to our editorial team. Welcome!

The Series is open to contributions from a broad range of industrial sectors such as healthcare, automotive, energy, agriculture, smart manufacturing, consumer electronics, smart city, VR/AR/hologram, drone, consumer electronics, Microwave and RF design for communication systems, and more. Series Editors would be happy to provide advice to potential authors regarding suitability of their articles to our Series. The articles aim to provide practical knowledge that is academically rigorous and relevant to industry professionals for improving communication products and services.

BIOGRAPHIES

MOHAMMAD A MATIN [SM] (mohammad.matin@northsouth.edu) is a professor in the Department of Electrical and Computer Engineering at North South University (NSU), where he has been since 2008. He received his B.Sc. degree in EEE from BUET, Bangladesh, his M.Sc. degree in digital communication from Loughborough University, United Kingdom, and his Ph.D. in wireless communication from Newcastle University, United Kingdom. He has published over 120 peer-reviewed journal and conference papers. He is the author/editor of 17 academic books and 21 book chapters. He serves as a member of the Editorial Boards for several international publications including *IEEE Communications Magazine* and *IET Wireless Sensor Systems*. He has received a number of prizes and scholarships including the Best Student Prize (Loughborough University), Commonwealth Scholarship, and Overseas Research Scholarship (ORS) conferred by the Committee of Vice Chancellors and Principals (CVCP) in the United Kingdom.

VYASA SAI [SM] (vyasa.sai@ieee.org) is a Senior Hardware Engineer in the Accelerated Computing Systems and Graphics Group (AXG) group at Intel, CA, USA. He received his Ph.D. in Computer Engineering from University of Pittsburgh, USA in 2013. Dr. Sai also holds a MS and BTech degree in ECE from the U.S. and India respectively. He has authored/edited books, published numerous international peer-reviewed articles and holds several US patents in the field of electronics and communications. He is the lead editor for the Design and Implementation of Devices, Circuits, and Systems Series and has the leading role in the Feature Topic development for the *IEEE Communication Magazine*. He also serves as a Technical Committee member for the *IEEE Circuits and Systems for Communications*, Editorial Board member for the *Intl. Journal of RFID Technology & Applications*, associate editor for *IEEE Access*, among others. His research contributions have won him many international recognitions that include AIM's 2018 Williams award, 2020 Sheth International Achievement award, among others.