Smart Consumer Electronic Systems
By Saraju P. Mohanty

I was invited by IEEE magazine managing editor Craig Causer and then Editor-in-Chief (EiC) Sachin Seth of IEEE Potentials to run a Consumer Electronics related special issue of IEEE Potentials in 2017. I then started thinking about a possible theme. During the same time period I was discussing to rename an IEEE conference, IEEE International Symposium on Nanoelectronic and Information Systems (iNIS) for which I am the Steering Committee Chair. After lots of discussion we came up with the idea to rename it to IEEE International Symposium on Smart Electronic Systems (iSES). To convince people I simplistically explained "Nanoelectronic and Information" Systems is essentially "Smart Electronic" Systems. So, I though why not I make this IEEE Potentials theme as "Smart Consumer Electronic Systems". The idea become more concrete when I was a panelist the IEEE International Conference on Consumer Electronics (ICCE) 2018 and presented the theme "Energy and Security Tradeoffs in CE Systems". The key message that I delivered is trade-offs among Security, Energy Consumption, Latency, Non-recurring Design Cost, and Recurring Design Cost is needed for effective current generation Internet of Things (IoT) enabled CE system design. This can be achieved by appropriate use of hardware and software components in the CE systems.

1. What is Smart Consumer Electronic Systems

The Smart Consumer Electronic Systems (or simplistically Smart Electronic Systems) can be considered as a class CE Systems that are envisioned to be Energy-Smart, Security-Smart, and Response-Smart. These 3 key aspects and design trade-offs among them is the key for the next generation CE. Energy-Smart ensures that energy consumption of electronics is minimal for longer battery life and smaller energy bills. Security-Smart deals with the security, privacy, or protection of CE Systems as well as that of the data or media that these systems capture, process, or store. Response-Smart refers to accurate sensing, intelligent processing to gather knowledge or information from the data, and fast actuation or response based on the information. Optimal combinations of hardware and software modules need to be explored for ESR-smartness of electronic systems. In the hardware perspective, it is a fact that a typical electronic system is an analog/mixed-signal system on a chip (AMS-SoC) containing analog, communications, digital, RF, memory, sensors, energy-source components as well as firmware, system software, middleware, and application software. We are in era of smart environments such as smart cities, smart homes, smart healthcare, and smart transport systems which are combinations of Cyber Physical Systems (CPS), realized using Internet-of-Things (IoT) that work collectively to provide intelligence or smartness. Hence, there is a need for new hardware, firmware, middleware, and software research that interacts with each other for efficient realization of smart electronics, IoT, CPS, and smart environments. This IEEE Potentials special issue makes an effort to bring this theme to the readers.

2. Scanning the Issue

I now briefly discuss the articles presented in this Special Issue. The articles were invited from selected established researchers. In addition, these were reviewed to ensure quality control.

Power Supplies for Consumer Electronic Devices: This article discusses the power supplies which are needed in every power driven CE systems.

S-CHIRP: A Secure Communication Mechanism for Heterogeneous IoTs: This article presents a secure protocol called S-CHIRP protocol for secure communication for heterogeneous IoTs with round-robin protection.

Neighbour Trust Based Security to Prevent DoS, Probe, Vampire and User to Root Attack in MANET: This article introduces a neighbor trust based security scheme that prevents malicious attacks in a Mobile Ad hoc Network (MANET).

Proof-of-Authentication - A New Consensus Algorithm for IoT-Friendly Blockchain: This article presents a new consensus algorithm which can make it possible for Blockchain to run in IoT with minimal computational requirements.

Drones – How this Ubiquitous but Disruptive Technology is Augmenting our Quality of Life: This article presents a comprehensive discussions of drone technologies in terms of research opportunities, and demonstrate through case studies while indicating the social, economic and scientific impacts.

A Method to Localize the Pupil of Eye for Point of Gaze Estimation: This article presents a method to estimate point of gaze on a screen using non-intrusive eye tracking which can be used for fatigue detection and attention tracking and hence can have diverse applications such as in smart cars and smart healthcare.

Revolutionizing e-Marketing via Augmented Reality: A Case Study in Tourism and Hospitality Industry: This article discusses the use of augmented reality in e-marketing with emphasis to hospitality and tourism industry.

3. Looking Forward

I would like to sincerely thank the IEEE magazine managing editor Craig Causer and the current Editor-in-Chief (EiC) Vaughan Clarkson of IEEE Potentials. I sincerely thank all the contributing authors because of whom this issue could become possible. I sincerely hope that this Special Issue of Potentials magazine will be a very good reading for many students and researchers as well as general readers around the globe. I wish you all a wonderful new year 2019.

About The Guest-Editor:

Saraju P. Mohanty (saraju.mohanty@unt.edu) is a Professor at the University of North Texas. His research is in Smart Electronic Systems which has been funded by National Science Foundations, Semiconductor Corporation, and US Air Force. He has authored 280 research articles, 3 books, and invented 4 US patents. His Google Scholar h-index is 29 and i10-index is 87. He is the EiC of the IEEE Consumer Electronics Magazine. He serves as the Chair of Technical Committee on VLSI, IEEE Computer Society.