

Editorial

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The year 2015 is almost here and we are excited to announce our lineup of special issues for the coming year! As always, THE PROCEEDINGS OF THE IEEE strives to offer reviews of broad significance and long-range interest in all areas of electrical, electronics, and computer engineering, as well as in computer science, and to continue to be a tutorial and technical information source with an emphasis on applications-driven technologies. We hope that you, our readers, find the content stimulating and applicable to your everyday work and your overall professional success.

Just as a reminder, in 2012, we published a special Centennial Issue with 69 additional articles looking at the past, the present, and the future of technology. This free issue remains available on the PROCEEDINGS Xplore homepage under “Past Issues/2012.”

Before highlighting our upcoming issues, let us look at the latest electrical engineering journal citation reports. THE PROCEEDINGS is the sixth most highly cited journal (by impact factor) in its category. More notably, it is the top ranked journal, if we look at the five-year impact factor and is ranked second by Article Influence Score. Looking at the metrics as a whole, we believe that THE PROCEEDINGS is performing well and providing important information to its reader community.

As mentioned in last year’s editorial, we ran a Reader Survey in December 2013. Thank you to all those who participated! We received a lot of valuable feedback and will be running a modified version of the survey again this year before introducing some exciting new features for the journal. A few of the interesting ideas received last year were a request for reintroducing reader comments,



availability of free online tutorials to complement the special issue content, more predictive papers, and the introduction of more multimedia into the content.

I. UPCOMING SPECIAL ISSUES

Now let us take a closer look at what we have planned for volume 103 in 2015.

Special Issue Contents: During 2015, we will be publishing a total of 12 issues that will cover a diverse range of important topics, from global healthcare, to electric ships, and flexible electronics to big data.

A. Global Healthcare

Recent scientific and technological developments and innovations have significantly improved the quality of life and saved lives in the developed world. But these developments are not introduced in the developing and underdeveloped countries. We still face unprecedented healthcare challenges in the 21st century. Today, the prevalence of major diseases, such as the global AIDS pandemic, antibiotic-resistant tuberculosis, and the Ebola threat, cuts across the healthcare, political, economic, social, and biomedical disciplines. These diseases will continue affecting the world unless major steps are taken to develop comprehensive prevention and treatment programs. Thus, engineers and scientists are expected to play a critical role in developing novel and affordable healthcare technology and medications to solve global healthcare problems, especially in the developing and underdeveloped countries.

The objective of this special issue is to discuss the global healthcare systems, financing, delivery, and management. It will also focus on the recent technological advances in healthcare and their use in diagnosing, treating, and preventing diseases, using novel technologies to develop new drugs, technology regulation, and ethical issues surrounding the use of novel technologies.

B. Design Automation of Electronic Systems

The origins of electronic design automation (EDA) can be traced back to the 1960s when researchers of some leading academic and industrial labs conceived the first computer-aided design (CAD) tools for supporting engineers in the analysis and synthesis of circuits whose complexity was growing dramatically. Many EDA tools and companies were introduced in the 1970s and 1980s. When EDA reached the plateau of maturity at the end of the 1990s, the design of complex embedded systems and sensor networks spanning different areas of technology set new challenging objectives. At the same time, traditional EDA problems became harder because of the need to address complexity and scalability issues for designs with over a billion transistors. In recent years, algorithms and tools developed in EDA have been applied to completely different fields of engineering and to biological sciences, such as the application of EDA algorithms to synthetic biology.

The purpose of this special issue is to provide an overview of the evolution of EDA over the years and to offer a perspective on some of the key avenues of future development. It will cover six main themes, namely, system design, microarchitectural and logic optimization, equivalence checking and formal verification, physical design and timing analysis, simulation and circuit design, and new frontiers of EDA.

C. Reconfigurable Systems

This two-volume issue will provide an in-depth treatment of the subject of reconfigurable systems as enabled through advancements in the electrical engineering field and the approaches we use to manage complexity in components having millions of fixed and programmable elements. The frenetic evolution of the field-programmable gate array (FPGA) as a preeminent digital platform is not only expected to continue for the foreseeable future but also will serve as an inspiration/ template for other functional domains such as analog, radio frequency, photonic, and even those not strictly electrical in nature, such as thermal, fluidic, and mechanical. The issues will serve as an immersion into the subject of reconfigurable systems, with a focus on gaining familiarity with essential theoretical elements, the key developments in the field, and the potential future directions (not just the next few years but decades beyond the present).

D. Multimodal Data Fusion

Multimodal data are now widely available in many areas, leading to important activities going on in parallel in many disciplines including medical imaging, remote sensing, image analysis, and metabolomics, among many others. In all these cases, the goal is making the best use of such data through fusion of the information from multiple modalities. While there are a number of challenges that are specific to a given domain and problem, a good number of

the challenges researchers deal with in such analyses are common to all. But unfortunately, there is little communication, if any, among disciplines to allow sharing of the common experience and see what one can learn from the experiences in another domain.

The goal of this special issue is to gather a carefully selected set of contributions from varied disciplines that will not only present a review of exciting approaches and results in their respective areas but will also report on their approaches and experiences in dealing with the major challenges they faced. Papers will also address a number of challenges that are common to many fusion problems and will be accessible to those outside their disciplines.

E. The Plurality of Brain–Computer Interfaces

This special issue on brain–computer interfaces (BCIs) will cover topics ranging from new approaches and principles in BCI research to clinical application and evaluation of such BCIs. The field of BCI research has been growing rapidly over the last few years. The special issue aims to show the whole range of brain–computer interfacing today, starting with new advanced signal processing and machine learning methods. Hybrid BCIs, illustrating how BCIs are reaching disabled users, will be covered, along with BCI technology including its latest applications, as well as current BCI research in the application of electrocorticography.

F. Physical-Layer Security and Its Applications

The wireless revolution is rightfully hailed for facilitating massive data exchanges, ranging from conversations, text, and e-mail at the personal level, to financial information, support for emergency services, and medical diagnostics at the institutional level. It also opens doors to the snowballing of security breaches, be they detectable intrusions such as theft of service or hostile jamming, or more covert acts epitomized by eavesdropping, arguably more worrisome since by nature eavesdropping is passive and thus undetectable. This explains increased concerns surrounding privacy and secrecy in wireless networks, which prove fundamentally easier to tap than traditional wireline links. Public awareness of the privacy risks inherent to a connected world has been spurred by many high-profile news stories, such as credit card data breaches or government surveillance programs, that have, by logical extension, heightened concerns about whether even simple banking or insurance apps on cell phones should be trusted.

The intent of this special issue is to bring together recent advances in physical-layer security that draw on communications, cryptography, information theory, networking, and database design, aiming to offer provable security against passive and active adversaries, be they computationally limited or computationally unbounded, positionally fixed versus mobile, while incorporating resilience to varying and/or uncertain channel states.

G. Big Data: Science Perspective

The current surge of public and scientific interest in big data has its roots in many technological and social developments. Technologies for sensing data of many types (via satellite, video, medical device, network monitoring) yield massive flows of data that can now be captured and stored on devices with massive capacity. In the public realm, the Internet led to a switch from text-based person-to-person communications to sharing of more data-heavy items, such as images, video, and interactive maps among groups. Users of smartphones can upload high-quality photos and video to social networks, via WiFi and third-generation (3-G) and fourth-generation (4-G) networks, in a matter of seconds. Large data sets are generated through bidirectional interactions, both people-machine interactions and machine-machine interactions.

From a scientific point of view, many of the interesting issues in big data lie at the intersection of computer science, statistics, linear algebra, optimization, and cognitive dynamic systems. The fundamental problem of extracting meaning from data, and turning that meaning into good decisions, draws on all these areas, with many variations depending on the type of data and the type of knowledge required. In this special issue, the main focus will be on the analytical aspects of big data.

H. Microgrids and Energy-Sustainable Buildings

This special issue focuses on recent research in the use of electric energy in commercial, residential, and other types of buildings and facilities. The articles in this issue will aim to cover a range of topics including a comparative evaluation of opportunities for improved efficiency among load classes in the buildings, the role of smart microgrids for enabling demand-side response, utility-side-of-the-meter electricity markets, customer-side-of-the-meter electricity markets, the role of alternative energy sources, and power grid informatics. The past few years have seen an explosive growth of interest in new opportunities for improved operation of electric power grids.

I. Memories in the Future of Information Processing

This special issue is devoted to the current research markers of highly integrated electronic memories and the exploration of their evolution toward new physical forms, new forms of organization, and in-memory information engines, where the computation itself evolves from the memory-centered information. More specifically, the issue will explore how electronic memories may evolve in forms that continue density improvement by including new physical mechanisms and a more complete use of the third dimension, how they organize so that accessibility is efficient, how they may be put together where the information engine distributed within the memory is an emergent form, and how they may appear in alternative forms of information processing. The issue will be organized into themes based on the following principles: the implemen-

tation of memories, the power density and data access, physical and logical organization of data and its memory storage, memory in the human brain and vision processing, and in-memory information processing.

J. Advanced Flexible Electronics for Sensing Applications

In this special issue, the papers will focus on two approaches that are currently being investigated in the area of flexible electronics. The first is how the substrates, materials, tools, and devices can be exploited for improved performance, thus leading to new applications. The second is a hybrid approach that exploits the advantages of high-performance microelectronics, but in a thin, conformal, and rugged format. This is especially interesting as it highlights both the challenges and opportunities that can be expected. Applications currently being actively explored include wearable (but flexible) electronics, large area sensor arrays, smart electronics for packaging, and electronics that are disposable, biodegradable, and/or implantable.

K. Electric Ships

The recent decade has seen large increases in international trade. Almost 80% of the global trade by volume is transported by sea. The carbon emission from sea transport vessels now accounts for more than 3% of the global emission, which is comparable to a large national economy. Sustainability is driving the shipping industry from conventional mechanical propulsion to electric propulsion. Furthermore, several countries are now introducing regulations and recommendations for shoreside electric facilities to provide shore-to-ship power while docked to reduce or eliminate NO_x and SO_x emission from ships. The electric ships with electric generation, integrated power systems, and dynamic loads will surpass the land-based concepts of microgrids, and will be the ultimate “smart grid” in complexity.

This proposed special issue will consist of several topical papers beginning with the history of electric ship propulsion, the present status of both commercial and military electric ships, and the ongoing research that will lead to the fully integrated all-electric ship. Papers will be on the type of commercial and military ships that are now going all-electric, and descriptions of the electric propulsion and electric distribution systems used today.

II. REGULAR PAPERS

During 2015, there will be a continued emphasis on invited papers for THE PROCEEDINGS. We have a diverse lineup of tutorial and survey papers, which will provide insight into a broad range of areas and applications. Each regular paper will continue to be highlighted by an introductory prolog to provide added informational value to our readers.

III. A PEAK AHEAD AT 2016

We will publish some additional exciting issues in 2016. One of the issues being planned is on structural health monitoring, which will provide a comprehensive review of the current technological advances within this multidisciplinary field. The special issue will cover topics ranging from sensing and data acquisition to data interrogation and decision-support systems. Additional focus will be placed on implementations of structural health monitoring systems in operational structures in the domains of aerospace, civil, electrical, and mechanical engineering.

IV. CONCLUSION

Your feedback is always welcome and we hope that you will enjoy our exciting lineup of special issues next year. We hope that THE PROCEEDINGS will continue to provide you with useful information that you can apply in your research and every day work and will keep you up-to-date on the latest developments in many different areas of electrical, electronic, and computer engineering. We also look forward to introducing some new features for the journal based upon the reader survey results and welcome you to participate this year if you receive an invitation. ■