

Writing for *IEEE Consumer Electronics Magazine*

By Peter Corcoran

You may have read some of my previous articles on writing content for *IEEE Consumer Electronics Magazine*, but there is no harm in reiterating the requirements and providing some guidance once in a while. We are now in our fifth year—my, how time flies—but there are points that many authors still seem to miss or get wrong. So let's do a quick recap.

IEEE Consumer Electronics Magazine is a full-fledged IEEE publication, and each issue will appear in *IEEE Xplore*. Therefore, all content will be available to *IEEE Xplore* subscribers, and your articles and submissions will reach a far wider audience than just the members of the IEEE Consumer Electronics (CE) Society. And, beginning this year, we also have an electronic version of the magazine that can be used for targeted distribution of content to other societies, even beyond the IEEE. In fact, one of our plans for 2016 is to share this content with a subset of the members of Engineers Ireland (EI) as part of the intersociety agreement between EI and the IEEE.

The quality and presentation of this content will, in turn, reflect on us as a Society. With this goal in mind, I intend to keep the material topical and of high quality. Thus, as a CE Society member, I ask you to consider writing a short article or review to share your experiences and knowledge with your fellow Society members. In particular, for those of you

with high achievements and responsibility, there is an even stronger mandate for you to share your experience and expertise. In many instances, it may not take a great deal of work. You may have already written reports or have students who have completed literature reviews, or perhaps you've completed a technology or product evaluation within your organization. All that may be needed is to follow some internal approval process to release the relevant material for external publication. In all such cases, I am more than happy to provide supporting letters, and I will gladly publicize, acknowledge, and promote the contributions of your organization to the CE Society and the IEEE. If you have any questions or would like to discuss possible articles, please contact me (dr.peter.corcoran@ieee.org).

A QUICK-START GUIDE FOR MAGAZINE CONTENT

SCOPE OF ARTICLES

Articles should be more broadly scoped than those for an archival journal. Review and tutorial pieces are particularly suited to the magazine. Technical articles may be acceptable, but they should be of general interest to an engineering audience and of broader scope than regular technical papers.

FIELDS OF INTEREST

Some examples are:

- ▼ digital broadcast and HDTV
- ▼ interactive and immersive TV
- ▼ smart imaging and cameras

- ▼ mobile devices
- ▼ digital video processing and codecs
- ▼ 3-D imaging and display
- ▼ home health-care technologies
- ▼ social and economic impacts of CE
- ▼ smart grid and CE
- ▼ home networks and services
- ▼ audio systems and technologies
- ▼ security and rights management
- ▼ HCI and user interface
- ▼ wireless and RF in CE
- ▼ new and emerging technologies
- ▼ wireless sensor nets in CE
- ▼ displays for CE
- ▼ storage and digital media
- ▼ CE and digital content issues
- ▼ device interconnects
- ▼ haptics and multitouch
- ▼ CE digital imaging
- ▼ gaming devices and systems
- ▼ CE and cloud computing.

We particularly welcome articles related to the story behind engineering standards or practical experiences in product specification and design, as we publish articles on the social impact of CE. We also encourage tutorials on CE-related technologies and techniques.

OUTLINE INSTRUCTIONS FOR CONTENT

There is no fixed template for magazine articles. Text should be provided separately from photos and graphics and may be in Word or LaTeX format. Original photos and graphics are preferred rather than those embedded in Word documents, because they reproduce better for magazine printing. You must own the copyright on any photos or graphics or

have obtained explicit permission for use of all such material when a third party owns the copyright [1].

You should include a PDF file with the proposed layout of your article. An IEEE copyright form will be required. The ScholarOne website (see below) will automate the generation of a single-submission document if you have the correct files prepared in advance. Submission through the website is preferred for all articles. The URL for this site is <http://mc.manuscriptcentral.com/cemag>.

SOLICITING PREVIOUSLY RUN ARTICLES

Another approach to acquiring interesting articles is simply to ask people. If you have read a compelling article recently that you think might be of interest to CE Society members, we can ask the author of that article if he or she would like to reach a wider audience. Many authors are delighted to customize an earlier article or provide a version that is revised or updated. So, if you have read some interesting articles recently, please feel free to approach the author on behalf of your Society. Or, if you prefer, give me a reference to the original article and an e-mail contact for the author.

You may also have peers or colleagues who are working in a field of interest to CE Society members. They may be willing to provide an article on a topic relevant to CE. Your editor will be more than happy to discuss such proposals and liaise with the authors. Occasional republication of articles and content is allowed by IEEE policies when the material is for the benefit of a new audience. Authors should submit their articles through the above-mentioned website.

HINTS AND TIPS

Get the graphics and figures right. Provide original JPEG, GIF, TIF, or EPS images. Copy graphics and figures from Microsoft products into a PowerPoint slide deck (one slide per figure or graphic), because we can export at 300 dpi from PowerPoint but not from Excel or Word.

Get the content on topic. Don't submit specialized research papers or articles on niche topics. Our content has to

have broad appeal to our readers, so provide technology reviews or tutorials rather than a specialized review of a particular technology. Such articles may be interesting to you and a handful of our readers, but *IEEE Consumer Electronics Magazine* is not the place for publishing archival research.

Ask a colleague to proofread your article. It is essential that the grammar and general use of English be of high standard. I do not have time to correct your English, so please make sure it is reviewed and corrected before making your final submission.

WHAT IF I DON'T KNOW WHAT TO WRITE?

Write a news article about IEEE activities with which you are involved; conferences, chapter meetings, special events, or workshops you attend; keynote talks



If you have “heroes” or mentors within the ranks of the CE Society, consider writing a “Champions of CE” article about them and their contributions.

you have attended; and so on. There are many past articles to give you an idea of what is publishable, and I welcome news contributions in particular. From reading this issue, you could be forgiven for thinking that the CE Society is active mainly in Japan and Ireland. There is a lot more going on in the CE Society, but I need people to write the articles; I can't be everywhere!

If you are involved with a local Chapter, then set an example for us all and write about your Chapter, the local town, and the industries for which your chapter members work. If you recently got involved with volunteering at a conference or participated in a Society meeting or event, then tell us about it! Sharing your experience helps the Society leadership with feedback and new insights that will help us appeal to our younger members.

If you have “heroes” or mentors within the ranks of the CE Society, consider writing a “Champions of CE” article about them and their contributions. If something bugs you, then consider writing a “Soapbox” piece. If there is something you don't like about the magazine or how our Society is run or you disagree with a point of view presented in an article, then consider writing a letter to the editor. There are many ways to contribute, and I want your contributions.

SOME IDEAS FOR POTENTIAL ARTICLES

The following is a short list of suitable topics for articles that may be of interest to your fellow CE Society members.

- ▼ local Chapter and chair events and activities
- ▼ IEEE conferences and workshops, particularly those sponsored by the CE Society
- ▼ literature/technology reviews that are relevant to CE (e.g., derived from a Ph.D. student's thesis work)
- ▼ major CE industry events and trade shows
- ▼ tutorials/evaluations of new CE-relevant technologies
- ▼ reviews of topical industry trends
- ▼ historical articles related to recent industry trends
- ▼ future-vision articles on trends in a particular CE industry sector
- ▼ social or economic impacts of CE
- ▼ specialized articles such as “Soapbox,” “Champions of CE,” or “What If?”

IN THIS ISSUE

We have another bumper issue to bring us into spring 2016—a range of interesting articles and even a new regular column with a focus on system-on-chip (SoC) hardware. In the CE industry, hardware really does matter! But first, let's start this overview with a look at the news from 2015.

SOCIETY NEWS

YOUNG PROFESSIONALS AT THE WEB SUMMIT

This was an exciting initiative originally started by the chair of IEEE Young Professionals (YPs). At one point, I

stepped in and had set up more direct participation for the YP in the main web summit event with a significant keynote speech, but we could not persuade IEEE Public Visibility to get involved and help with funding. Nevertheless, the IEEE YP leadership set up their own event and coordinated a group of local volunteers to have a very nice meeting right beside the web summit in the heart of Dublin. You can read all the details here and meet some of the people from IEEE YP.

CHAPTER CHAIR MEETING AT GCCE

There was a Chapter chair meeting at the GCCE conference.

LOCAL EVENTS

We really do need more input from our local Chapters. Please contact me if you would like to write about local events, talks, etc. I would be very happy to assist and mentor people to prepare interesting articles about our Chapter and local activities.

CONFERENCE REPORTS

The CE Society currently operates a lot of conferences—at last count, probably more than ten for which we as a Society are directly responsible. However, it is sometimes a real challenge to get good reporting on these conferences. If you are a regular reader, you'll also probably notice a common trend—that is, if your editor attends a conference or event, there tends to be an article about the event. I believe that is what is called “leading by example,” but I am beginning to feel a bit alone out here in this journalistic desert.

Now, because the theme of this editorial is “writing for *IEEE Consumer Electronics Magazine*,” I want to reach out to our membership and strongly encourage people who attend our conferences to consider following in my pen-steps, as it were, and provide a personalized report on any of our conferences you attend. It really is not that difficult. You can generally rustle up a lot of images by reaching out to the conference chair and organizing committee (I'd be happy to facilitate and make introductions), and if you have some of your own photos, that's even better. Then, you need some background

information on the conference venue, some details on the keynotes and speakers that you heard, especially those who impressed you, and finally a few pictures of the town where the conference was held to add a touch of atmosphere to the story. Oh, and a couple of thousand words to glue it all together.

THE CE SOCIETY CONFERENCE-REPORTING COMPETITION

As an incentive, I'll offer a role on the editorial board in return for any article that is good enough to print and provides your personal experiences and insights about one of our CE Society conferences you attended. (I'm also going to hassle our treasurer to see if he may be willing to allocate a financial stipend to encourage such efforts—but your main reward will be celebration of your authorship in these pages.)



His speech was thought-provoking and challenging for the delegates, placing significant emphasis on the ethical dilemmas that technology often poses.

So, for 2016, I am introducing a conference-reporting competition, with up to three prizes at the end of the year for the best article(s) about a CE Society conference. And, to level the playing field, I'm going to disqualify any current members of the editorial board from competing, so only new authors should apply. Enter early and enter often, because *you* could be the winner!

ISTAS CONFERENCE AND PRESIDENTIAL KEYNOTE

The IEEE International Symposium on Technology and Society (ISTAS) 2015 celebrated its 21st Anniversary in Malahide, a charming seaside town just outside Dublin, Ireland. More than 120 delegates from 21 countries and five continents participated in ISTAS 2015, held in the Grand Hotel Malahide, County Dublin, on 11–12 November.

The central theme of this year's symposium was “Culture, Ethics, and the Knowledge Society,” with a strong focus on showcasing 2015 as the European Year for Development.

The conference was organized by Paul Cunningham of IST Africa, and I compliment Paul for choosing the best conference venue I have experienced in a long, long time. Malahide is just a 20-min train ride into the center of Dublin, but it offers a unique seaside atmosphere with a small town center just outside the hotel grounds where one can find quaint Irish pubs and stroll along the sandy beaches that surround the town.

The conference had a rather unique opening keynote speech, which Ireland President Michael D. Higgins presented. The president is known for his global perspectives, support of human rights, and interest in the social impact of technology. His speech was thought-provoking and challenging for the delegates, placing significant emphasis on the ethical dilemmas that technology often poses to those who wield it and on the personal responsibility of every individual to ensure that technology is applied correctly to benefit all citizens. In fact, his speech was so good that I have decided to publish it to remind each of us of our responsibility to our fellow humans and the Society we serve as engineers and technologists. And we have some nice photos to capture the event.

GCCE CONFERENCE IN JAPAN

GCCE—the IEEE Global Conference on Consumer Electronics—is the first international conference hosted in Asia by the IEEE CE Society. The conference was established by Stefan Mozar, Stephen Dukes, and Tomohiro Hase with the aim of introducing the world to the latest CE technologies, including theoretical studies and practical applications from across Asia.

The conference has been held in Tokyo every October since 2012, and last year, for the first time, it was held in Osaka, where the CE Society has a large and active chapter. This news article, with many images from the conference, will give you a real sense of the

GCCE experience and a taste of the mystic charm of Japan. Thanks to Tomohiro Hase and his team for putting this report together.

PUBLICATIONS ROUND-UP

Stu Lipoff, our vice president of publications, brings us his regular round-up. In this issue, he focuses on the new “electronic” version of this magazine. In particular, this version will enable us to reach a wider audience through selected distributions of *IEEE Consumer Electronics Magazine* to other IEEE Societies. This is an important and welcome new initiative for 2016 that should help to grow our membership and promote our activities and the CE Society beyond the core IEEE membership. Thanks, Stu.

FUTURE DIRECTIONS

A LOOK BACK AT IoT ACTIVITIES FOR 2015

Thanks are due to Soumya Kanti Datta, chair of the Future Directions Internet of Things (IoT) interest group. Soumya was active in 2015 running IoT-related panels at ISCE in Madrid, Spain; at ICCE in Berlin; at GCCE in Osaka, Japan; at the World Forum on Internet of Things (WF-IoT) in Milan, Italy; and again at ICCE 2016 in Las Vegas, Nevada. Here, he gives details of both successfully completed activities during 2015 and planned events for this year. If you are interested in or working on IoT-related technology—and I know that many of you are—then Soumya is the person to contact to get involved as a volunteer. Feel free to reach out to him at soumya-kanti.datta@eurecom.fr.

CE SOCIETY AT THE WORLD FORUM ON THE IoT IN ITALY

The IEEE CE Society Future Directions team on IoT successfully organized a special session on the IoT and Fog Computing during IEEE WF-IoT 2015 in Milan, Italy. The session, “S17: IoT and Mobile Edge Computing,” was held on Wednesday, 16 December 2015. It consisted of six research paper presentations and attracted around 65

participants. You can find further details and see some pictures in this news article.

CE SOCIETY RUNS AN IoT WORKSHOP IN MALAYSIA

Yet another IoT initiative from Soumya and co-conspirators. Yes, those IoT guys sure are a busy and active bunch! Even your editor contributed a remote video keynote speech to this workshop. Future directions really are showing the way with regard to providing local leadership and useful technical events for our membership through conferences and local workshops. Big thanks go to both Soumya, for his organizational efforts, and to Tom Coughlin, who originally set up Future Directions within the CE Society and who continues to chair the committee and oversee and facilitate these activities.

FEATURE ARTICLES

Next, we move on to the feature articles for this issue.

IEEE IN IRELAND

Now, although this is not quite a CE Society activity, I know from my own volunteer experience that it is a slow and initially quite laborious process to engage and marshal local volunteers into a functional IEEE infrastructure. And, because we’ve seen a recent visit by CE Society leadership to EI (last issue), I thought it was worth publishing an account of how an experienced and long-standing IEEE volunteer such as Rob Reilly goes about building a local critical mass of volunteer effort into a working organization. I have been assisting and observing Rob’s efforts over the past two years or so, and it is all starting to take shape nicely as more and more people come out of the woodwork. This report provides a nice, succinct overview. A big “thank you” goes to Rob on behalf of the IEEE membership in Ireland. (By the way, does anyone note that there seems to be a lot of IEEE activity in Ireland these days? What has happened to the rest of the world? Y’all still alive out there? Zombie apocalypse anyone?)

AN OPINION PIECE ON OPEN ROUTERS

We have an interesting article on recent FCC regulatory developments. This article considers whether FCC 14-30 is an attempt to limit individuals and communities from using open-source software to modify their routers to take advantage of impromptu networks and unrestricted communications or whether there is a bona fide rationale for why the FCC doesn’t want people to play with the software on their wireless routers. William Lumpkins is a regular contributor to *IEEE Consumer Electronics Magazine* and an associate editor. He is also a wannabe ham radio operator.

THE QUEST FOR THE QUALITY OF THINGS

As put by the authors, Marianne Dempsey, “No one knows yet what the expected proliferation of the many new product categories in the emerging IoT will look like in the coming years, but one thing is certain: their success or failure will be driven by unwavering consumer demands for increased quality.” Dempsey goes on to develop the concept of “Quality-of-Things.” Note that this has nothing to do with the communications between the things but, rather, the operation of the things themselves. Have I piqued your interest? Then read on.

ENABLING 360° VISUAL COMMUNICATIONS

The quality of digital imaging on smartphones has continued to improve over the last few years, and the addition of a second, user-facing camera on modern devices has greatly enhanced their flexibility. It has led to new uses and resulted in a minirevolution in digital photography and a new word added to the English language—the “selfie.” Where do we go from here with digital imaging technology? What is the next silver bullet for imaging, and can it, too, add a new word to the English language?

Can 360° imaging add enough value and functionality to already sophisticated smartphones? Can it break the rules and create new modes of imaging and deliver must-have capabilities to the next generation of devices? Louis Brun

and Alessandro Gasparini of ImmerVision may have the answers to your questions. “All-Around-ie,” anyone? (Or, maybe an “ARoundie” is more catchy? Note the AR at the start; if it gets into the Oxford English dictionary, do remember where you saw it first.)

HACKING THE HOME—PART 2

In the last issue, Stu Lipoff was hacking his doorbell so he could get his newspaper, come rain, hail, or snow. Guess what? The doorbell was only the beginning.

IoT—A BETTER LIFE

We’ve all heard about the smart city, the smart home, the smart car, and the IoT that makes all of them a reality. However, none of these technologies on their own can provide real benefits and improve our quality of life. We need practical interfaces and services that enable these technologies and allow us to use them in our daily lives. S.M. Riazul Islam, M. Nazim Uddin, and Kyung Sup Kwak examine a number of practical-use cases and develop requirements for IoT systems and services to work easily for the end user, thus delivering on the promise of a better life through the IoT.

SoC DESIGN-FLOW TUTORIAL

To complement our new column, “Hardware Matters,” this article provides a top-down tutorial of the process for designing and implementing the complex mix of integrated circuits that make up one of today’s SoC components. This article will be of interest to anyone involved in CE product or system design.

In practice, such SoC components are at the heart of any modern CE product. Due to their complexity, there are multiple levels of design abstraction, and this tutorial works through them with an emphasis on practical considerations, such as the need for integration of design and manufacturing processes. Some of today’s challenges and emerging trends are also discussed. This article was contributed by Anirban Sengupta of the Indian Institute of Technology Indore. He will also manage our new “Hardware

Matters” column. Thanks, Anirban, for your contributions to the magazine.

SIMULATION SYSTEMS FOR WIRELESS SENSOR NETWORKS

A wireless sensor network (WSN) is a distributed set of sensor nodes deployed to work together for collective sensing and data processing. A WSN can be used to monitor environment, behavior, and system integrity in a variety of application fields. These networks form an integral part of the CE infrastructure of “smart” buildings, vehicles, and cities. This review article focuses on existing WSN simulation frameworks that could be integrated with real-time hardware prototypes. Various such simulation frameworks are analyzed and compared, and a suitable simulation environment that supports specific software packages is determined.

SPECIAL SECTION ON SMARTPHONE BIOMETRICS

This special section includes two papers adapted from the ISTAS 2015 conference. Thanks to Paul Cunningham, chair and organizer of ISTAS 2015, for facilitating this section of the issue. I was hoping to have some additional contributions from conference authors, but unfortunately, Paul was traveling in Africa and had only intermittent Internet access, so we didn’t manage to coordinate as I’d hoped. Nevertheless, we may feature an additional special section in our July issue.

The articles here consider the impact of biometric technology as it evolves and becomes integrated into our smartphones. This is a topic in which I’ve been interested for some time, as some of our regular readers will know [1]–[5]. Fingerprint technology is already in our devices and, in fact, has been used since the mid-2000s in early devices such as the Pocket PC or the iPAQ.

More recently, we have seen efforts to introduce the next generation of biometric techniques, notably facial and iris recognition. Both are proven biometric technologies in forensic and

enterprise-level applications, where relatively expensive technology can be employed to ensure accurate data acquisition. The challenge for smartphones lies in achieving similar levels of accuracy with unconstrained handheld devices [6], [7].

But, such challenges can be met, and engineers are now very close to working solutions [8]. Thus, in the not-too-distant future, our smartphones will be able to identify their user, as I originally discussed in [1]. So, what then are the implications of this emerging capability? Well, this is the focus of our special section—what happens when our devices are able to tell who is using them? Read on to find out.

THE IMPACT OF SMARTPHONE BIOMETRICS

The lead article for this section examines the potential synergies between smartphones and biometric technologies. It presents the practicalities and challenges for three such technologies—fingerprint, iris, and palmprint recognition. It discusses the use of biometrics for personal authentication, including the use of zero-knowledge proof techniques to ensure that the biometric data do not leave the phone. The scope for data theft and breach through spoofing of the original biometric data are also discussed. Finally, the potential impact of this technology synergy on personal privacy is considered.

FINGERPRINTS: ARE WE READY?

Almost every 2016 flagship mobile phone, whether Android or iOS based, is set to come with an integrated fingerprint reader. The convenience and benefits of fingerprint readers are clear to users, but is the underlying technology really ready for widespread adoption? This article explores some of the background of the challenge of secure user authentication on mobile devices, as well as recent weaknesses identified in the handling of fingerprints on many consumer devices. It also considers legislative and social implications of the widespread adoption of fingerprint authentication. Finally, it speculates on some future problems we may

encounter as fingerprint technology is adopted more widely.

IRIS AUTHENTICATION ON SMARTPHONES

This article outlines various technical, social, and ethical challenges in implementing and widely adopting iris-recognition technology on consumer devices such as smartphones and tablets. The piece notes that acquiring sufficient-quality iris images using today's consumer devices is the main challenge in implementing this technology. Current progress in this field is reviewed. A smartphone form factor camera is presented to be used as a front-facing camera. This device is modified to capture near-infrared iris images along with general-purpose visible wavelength images. Analyses have shown that such a device, with improved optics and sensor, could be used for implementing iris recognition in next-generation handheld devices.

The article discusses the social impact of wider adoption of this technology. Liveness detection and iris-pattern obfuscation are presented as measures for addressing various security and privacy concerns that may arise when iris recognition will be a part of our daily lives.

TECHNOLOGY IMPACTS

In this issue, we have an interesting selection of articles on emerging technologies and their potential impact on our daily lives and on the social structures that surround us.

Thanks, as always, are due to Katina Michael for her contribution as senior editor. In this issue, I am pleased to introduce Sally Applin as an associate editor and member of our editorial board. Sally will be assisting Katina and has shepherded a number of articles for this issue. Thanks, Sally.

ETHICS AND "MEDIATED LOOKING"

In the lead article "The Changing Ethics of Mediated Looking," Joseph Ferenbok, Steve Mann, and Katina Michael consider many of the complicated changes that are being effected in human-to-human and human-to-computer interactions as the use of wearable and veillance-enabled technologies spreads more

widely. Some of us have experienced the strange uneasiness of engaging with a wearer of Google Glass, wondering whether the person is recording our conversation or checking our web profile as we engage in casual conversation. And, as these technologies become more widespread, how will they affect our daily interactions with each other? There was a time when it would have been considered quite rude to leave a conversation to answer your mobile phone. But today, we have grown to accept that many important aspects of our daily lives are encapsulated in these small personal devices and that it is acceptable to disengage from a conversation to respond to calls, texts, or e-mails. What other shifts in behavior lie ahead of us?



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WEARABLE SMART JEWELRY: DOES IT MAKE SENSE?

In the next article of our "Impacts" section, Ramona Pringle considers the impact of smart jewelry, in particular the Ringly—a smart ring that filters and mediates events on your smartphone, signaling the more important e-mails, messages, and events using a subtle color-coded scheme. So, by simply looking at your Ringly, you'll know if you need to break off a conversation and whip out your smartphone. The author kindly shares her insights as an early adopter of this new tech and muses on its effectiveness. Keeping the consumer happy is never an easy task.

THE RISE OF SOCIAL MACHINES

Next is an article from Nigel Shadbolt, Max Van Kleek, and Reuben Binns from the Computer Science Department at Oxford University on "The Rise of Social Machines." What is a social machine, you ask? Well, *Wikipedia* is the biggest example under our noses. It's where people

come together to exploit the computational resources of the web and collaborate to generate a new and useful product or service. There are many other examples, but the essence of a social machine is that it represents an emerging and genuine partnership between humans and machines, between data, human cognition, and machine algorithms blended in myriad ways.

This article develops a broad and persuasive vision around the growing potential and importance of this emerging field of technology, which is enabled in particular by the growth of consumer devices such as smartphones and their capacity for gathering both raw data and personal inputs. These are the input nodes for the social machines of tomorrow. This article is a must-read to gain insight into how these machines can leverage the power of the Internet mediated by personal responsibility and human considerations.

THE PROBLEM OF COUNTERFEIT ELECTRONICS

Karl David Stephan brings us down from lofty heights to consider the real-world problem of counterfeit electronics; it is more extensive than you might expect and costs legitimate manufacturers as much as US\$100 billion per year. But, perhaps more important is that there are significant social and environmental costs, because counterfeit products can flout industry rules, regulations, and even laws that support sustainable manufacturing practices and enforce environmental and health and safety regulations. In brief, the world has a much larger problem, as explained by the author. This is a short piece, but a thought-provoking one.

Thanks again to all our authors and editors for bringing us another insightful "Impacts" section!

REGULAR COLUMNS

Next, we have our regular roundup of columns.

BITS VERSUS ELECTRONS

In this issue, Bob Frankston explains how he brought the IoT into his home. Naturally, Bob wasn't happy with buying

things off the shelf, so he's built his own IoT ecosystem. As he puts it, he is not an early adopter but an "early adapter." So, if you are interested in building your own home infrastructure, including embedded node.js servers to manage your lighting, then you'll find both low-cost hardware and simple scripting examples and advice here. And, of course, it's all laced with Bob's unique insights and philosophical considerations about software, networks, and the importance of prototypes and programmability. As always, an eclectic and thought-provoking mix, combined with a how-to for your home IoT. My thanks for another inspiring and insightful column, Bob.

STORAGE VISIONS

Memory is a critical element in the design of consumer devices. Solid-state memory has assumed an even more important role in the future of consumer devices, both as short-term data memory and for longer-term storage. In this issue, our storage expert, Tom Coughlin, takes a look at flash-memory technology and its evolving importance across a range of CE devices. Although many consumer devices rely on advanced resources and content stored in the cloud, they are also used to capture and create content locally. Thus, the role of storage has never been more important, and it continues to evolve at a fast pace. Tom's column is an essential read for anyone working with memory systems in CE devices. Thanks, Tom, for your ongoing contributions to *IEEE Consumer Electronics Magazine*.

MARKET-BASED ANALYSES

David Alan Grier brings us his regular column, with thoughts on the CE marketplace and how engineers and the markets have influenced each other over time. In this issue, he considers the evolution of the audio-recording industry and the concepts of "high fidelity" and the aspirations of both engineers and musicians to improve and enhance the end product for consumers. It's an interesting historical perspective—and, as always, there are

lessons to be learned for today's audio engineers. Thank you, David.

NEW COLUMN—HARDWARE MATTERS

It is a great pleasure to introduce this new column to be written and managed by Anirban Sengupta. This column aims to provide insight on various aspects of SoC hardware system design, widely employed in the EDA/VLSI industry and how these aspects are increasingly relevant to CE product and systems design.

Today's new CE devices rely on complex SoC designs, which often comprise multiple IP cores provided by various vendors. As nonrecurring engineering costs continue to rise, it is rarely viable for a single company to subscribe to these costs. So, we see a complex new set of challenges facing the industry in terms of ownership, royalty payments, shared intellectual property rights, and associated business issues such as financing, liability, and protection of know-how and IP rights. This column explores and considers various aspects of hardware systems relevant to today's CE industry. Our first article takes a deep dive into some of these issues and outlines key challenges.

Future columns will explore some of these challenges and their impact on the industry. Note that submitted articles and suggestions for invited articles on related "Hardware Matters" are welcome, because in CE, hardware is the core of our products, and hardware really does "matter." Please contact me or Anirban at asengupt@iiti.ac.in if you would like to make a suggestion.

PRODUCT REVIEWS

Our regular product review column was submitted by Will Lumpkins, a long-standing contributor to and editor of *IEEE Consumer Electronics Magazine*. In this issue, Will has a bumper set of reviews, as products flooded in during the Christmas season. Unfortunately, our production schedule doesn't get the reviews in on time for Christmas. We'd have to get the products in the early summertime for that to happen (manu-

facturers, pay attention here), but it does mean we have a packed spring collection of new technology products, and Will has done his usual thorough job of evaluating them for you. Enjoy!

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ERRATA

In the January 2016 issue of *IEEE Consumer Electronics Magazine*, the article "The Dark Side of Video Games" by Katherine Albrecht, Katina Michael, and M.G. Michael contained the incorrect bio for coauthor Katherine Albrecht. Albrecht is currently with StartMail. We apologize for the error.

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