from the **EDITOR**

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Reflections on Signal Processing

n my September 2013 editorial, I announced the addition of a new column in IEEE Signal Processing Magazine (SPM), called "Reflections." In this issue of SPM, we are fortunate to have three very well-known signal processing experts share their "reflections" on a thought-provoking topic, i.e., signal processing inside. The reflections were based on the following three questions Andres Kwasinski, one of SPM's area editors of columns and forum, posed to these three colleagues: 1) How would you explain to a layperson what signal processing is? 2) In technical terms, what does signal processing mean to you? and 3) Where do you see the field of signal processing ten years from now? Andres kindly asked me to expand on this exercise, which I gladly undertake below.

In my May 2013 editorial, I wrote, "My personal view is that we have to be more active in disseminating success stories of signal processing...to the public at large." A prerequisite for a layperson to understand the success story is naturally a grasp of the essence of signal processing. We have often been asked by a layperson the question of what signal processing is. My preferred answer is to describe a problem that is easy to understand and to highlight some aspects of signal processing in its role in solving the problem. I often choose hearing aids as my example. But what makes the person attentive, and fascinated at times, is the development from the ear trumpet or ear horn to (wireless) digital hearing aids. Signal processing, the brain of today's hearing aids, is a set of algorithms, implemented on a computer chip, in that chain from sound (signal) entering through a microphone

processing manipulates the input signal so as to provide a more authentic listening perspective to the hearing impaired. In that example, one would be able to articulate in layperson's terms different aspects of that manipulation, such as transformation, compression, filtering, (adaptive) feedback cancellation, to mention but a few.

We are fortunate to work in this fasci-

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nating discipline of signal processing. On many occasions, I have held this common discussion with colleagues where I try to convey the fact that signal processing is an enabling technology that can solve problems in diverse areas within electrical engineering, ranging from power systems, to microwave engineering, to electromagnetic field simulation. Thus, electrical engineers must have a solid foundation of digital signal processing. We also all know that signal processing is instrumental and powerful to solving advanced problems outside the area of electrical engineering. From my perspective, signal processing means that we can work together with engineers and scientists, such as mechanical engineers, biologists, geophysicists, and psychologists. We are living in a most interesting and challenging era due to the continuous growth of interdisciplinary research that opens doors, not only for solving specific problems, but also developing new tools that derive from the applications.

It is not easy to answer the last question: Where do you see the field of signal processing ten years from now? This very same question concerns us in *SPM*, when we decide which special issue (SI) should be selected for publication. Would anyone have predicted ten years ago the emergence of compressive sensing or compressive sampling?

An SI on compressive sampling appeared in *SPM* in 2008, but for the signal processing practitioner there is still much more to come in this area, and our concern in the next decade will be more on the advancement in realization that may warrant another SI.

Signal processing in complex networks is another area with many challenges. Numerous applications from various disciplines motivate the need to study and develop decentralized strategies for signal and information processing. In May 2013, we published an SI on adaptation and learning over complex networks. Therein, strategies are presented that are able to endow complex networks with real-time adaptation and learning abilities, a way forward to solving inferential problems in complex networks. Recently, a call for white papers for an SPM SI on signal processing for big data was published; this SI is scheduled to appear in September 2014.

Big data present challenges in which resources such as time, space, and energy are intertwined with data resources. With these challenges, opportunities for signal processing arise and will take on a key role in the forthcoming decade. The good news in all of this is that we all have enough problems to solve for the times to come, and each solution presents new problems, which will keep signal processing a dynamic and ever-stimulating and growing discipline.

I invite you to share your thoughts with the signal processing community via the new "Reflections" column, as *SPM* is the main vehicle of communication among IEEE Signal Processing Society members.

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Digital Object Identifier 10.1109/MSP.2013.2276657
Date of publication: 15 October 2013