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Impact of Signal Processing and of Our Work

As many of you have heard, Thomson Reuters has recently released its *Journal Citation Reports (JCR)*, where *IEEE Signal Processing Magazine* has ranked first among all IEEE publications (125 in total) and among all publications within the electrical and electronics engineering category worldwide (245 in total). *JCR* provides "a systematic, objective means to critically evaluate the world's leading journals, with quantifiable, statistical information based on citation data. By compiling articles' cited references, *JCR* helps to measure research influence and impact at the journal and category levels" [1].

This is a great honor for our magazine, and it reflects the impact of signal processing as a field and of our work as a community. The credit and appreciation go to our authors, reviewers, editorial team, staff members, and especially the readers—who value and make use of our magazine's articles in their research, education, and engineering practice.

The societal impact of signal processing and its extraordinary variety of applications constitute the underlying basis for our magazine's top impact factor. "Signal processing inside" is our slogan, highlighting the fundamental importance of signal processing to many engineering disciplines and its pervasiveness "inside" all sorts of electronic devices and technologies. To turn the "inside" out, our magazine created the "Special Reports" column that publishes application-oriented articles to appeal to the general public. The application areas covered so far include global positioning systems, consumer electronics, search for extraterrestrial intelligence, and smart grid (e.g., [2] and [3]). As a powerful evidence of the ubiquity of signal processing, the magazine is devoting several

Video surveillance cameras such as this one are used widely, mostly for monitoring traffic and security applications. IMS Research projects that China will account for 70% of security camera shipments in 2014, with the United States purchasing 12% of global shipments and the rest of the world the remaining 18%. (Image courtesy of Analog Devices.)

XMC module for video streaming from unmanned vehicles. The module uses two TI TMS320DM6467 DSPs for processing two streams of up to 1,080p H.264 (or JPEG 2000) encoding. Up to four streams of input data can be compressed in parallel.

NOD TO DSPs

While DSPs seem to have competition for driving the technologies that will enhance many of today's and most of tomorrow's video surveillance systems, Prof. Mohan S. Kankanhalli, who is also the vice-dean of the School of Computing at the National University of Singapore, gives the nod to DSPs.

Kankanhalli analysis is based on his studies in two areas: One is multimedia surveillance, where he has been investigating the use of multiple sensors, which could be multiple cameras or different kinds of sensors, such as cameras, audio sensors, infrared cameras, and motion sensors. He also is looking at the coordination and control of multiple active cameras, where the cameras sense the environment, process the sensed data and react to the results—for instance, panning or zooming towards an object of interest or collaboratively trying to track a person so that the person is never lost.

"I believe the requirement for DSPs will only increase with time," says Kankanhalli. "More processing can and will be done at the camera nodes. It could be merely compression or it can be more sophisticated processing. With the increasing usage of IP cameras, the cameras will be linked with each other for form networks."

He points to the trend towards using multiple cameras, either to improve the surveillance quality or to increase the coverage, or both. "Once we have multiple cameras, the issue of data transmission becomes important. Moreover, the possibility of distributed computation comes into the picture."

If the data is transmitted to a central server, the data has to be compressed and some minimal amount of on-camera processing is desirable (like motion/blob detection). And if it is a large camera network, then a large amount of distributed processing is possible by spreading the computation around in the camera nodes, which can be accomplished by a DSP coprocessor.

Kankanhalli says that current research in the area of computational photography will also lead to more computation done at the camera, which he believes will require DSPs.

What's next? Just about everyone is trying to differentiate their product or service in some way. One possibility, says Heape of Altera, is the adoption of more "sensor fusion"-based technology in surveillance products in the future that would combine video cameras with infrared for range finding and other functions.

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recent and upcoming special issues to multicores, astronomy/cosmology, video analytics/surveillance, mobile media search, finance, genomics/proteomics, and social networking/learning [4]. Looking forward, we published numerous examples of signal processing-enabled future wants and needs in [5] and [6].

Another hallmark of our magazine is its broad coverage of diverse technical areas yet with appropriate mathematical depth and rigor. In [7], I created a matrix to help organize wide-ranging signal processing topics while advocating the development of unifying methodologies. Many effective signal processing techniques are successful, not just in one application area as defined by one entry in the matrix, but frequently in other areas, although area-specific intuitions often need to be insightfully applied. A large part of our magazine is aimed at providing tutorial articles with interplay across different application areas with common methodologies and with rigorous treatment. Examples can be found in this special issue, run by a top-notch guest editorial team, where the highly principled graphical modeling techniques are successfully applied to a variety of signal processing problems with the problem-specific insights elegantly offered.

As a signal processing community, let's embrace the vitality of our field, celebrate the impact of our work, and share the honor of the number-one ranking in citation impact, which reflects the quality of our work and the societal influence of our field.

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