



Journal of Real-Time Image Processing: second issue of volume 15

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As stated in earlier editorials, this year in 2018 two volumes—volumes 14 and 15—are published. Thus far, volume 14 has been concluded with four issues and this issue is the second issue of volume 15. The first issue of volume 15 was a special issue. Starting in 2019 or starting with volume 16, there will be six issues per year with 250 pages per issue. In other words, there will be a print budget of 1500 pages in 2019 and beyond. This increase in the number of issues and thus print pages has been done to address the delay in print versions of online first articles. This delay has been created due to the limitation in the number of print pages annually and the steady increase in the number of submitted manuscripts to the journal which has now reached more than 400 manuscripts per year.

It is gratifying to see that the recognition of the journal has been continuously growing. An indication of this growth is the increase in the number of downloads in 2017 which reached 76,000+. The journal is now listed in the top 20 journals in Imaging Science and Photographic Technology. In a survey that was conducted by Springer, 87% or the great majority of the authors rated their overall publication experience as excellent or good with the consideration that the acceptance rate of manuscripts in the journal in 2017 was only 20%.

It is worth mentioning that a key aspect of the success of JRTIP originates from a stable transatlantic cooperation between the Editors-in-Chief: Matthias Carlsohn and Nasser Kehtarnavaz (see Fig. 1) who have been addressing and resolving issues related to the journal from different but balanced perspectives based on their academic and industrial experiences in real-time image processing.

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As has been practiced for many years, an editorial board meeting was held during the SPIE Conference on Real-Time Image and Video Processing in Orlando as part of the SPIE Symposium on Defense and Commercial Sensing. This symposium rotates between the three cities of Baltimore, Anaheim, and Orlando. It is worth mentioning that for next year's conference in Baltimore, the name of the conference is going to be changed to SPIE Conference on Real-Time Image Processing and Deep Learning for the purpose of addressing the growing and widespread use of deep learning in image processing.

Various issues regarding the journal operation were discussed in the editorial board meeting. A picture of the editorial board members who were in attendance at the meeting is shown in Fig. 2. The main issue discussed was the importance of the Associate Editors taking all the actions necessary to shorten the review time of submitted manuscripts. It has been observed that many reviewing delays can be avoided or minimized when the assigned AE to a manuscript takes steps to identify reviewers who are genuinely interested in reviewing the manuscript before inviting them to review it. Such reviewers can be identified based on the reference list of a manuscript, the authors who previously published in the journal on the same subject, and the AE's own contact list.

Here we wish to express our much gratitude and appreciation to the JRTIP general manager at Springer, Mrs. Beverley Ford, who will be retiring at the end of the summer. Our sincerest thanks to her for all her management and support behind the scene to make JRTIP successful. On behalf of the entire editorial board, we wish her all the best and happiness in her retirement.

All those who are interested in supporting and shaping the real-time image and video processing community more actively are invited to join the Special Interest Group for Real-time Processing of Image, Depth and Video Information on LinkedIn via this link <https://www.linkedin.com/groups/8118079>.

This regular issue consists of 13 papers addressing different aspects of real-time image and video processing. The



Fig. 1 JRTIP's Editors-in-Chief (April 2018): Matthias F. Carlsohn and Nasser Kehtarnavaz

first paper by Kalali et al. is entitled “A low energy intra prediction hardware for high efficiency video coding”. This paper discusses pixel equality based and pixel similarity based techniques to reduce the amount of computations by the HEVC intra prediction. It is shown that the pixel equality based technique does not alter the PSNR and bit rate while the pixel similarity based technique increases the PSNR slightly for some video frames and decreases it slightly for some other video frames.

The second paper by Abdelghaffar et al. is entitled “A multi-agent-based approach for fuzzy clustering of large image data”. This paper discusses an approach for fuzzy image clustering to improve the computation time of the

sequential fuzzy c-means clustering algorithm. It involves distributing the computation of cluster centers and membership functions among several parallel agents, each operating on a sub-image. The experimental results show that the computation time outperforms that of the conventional sequential fuzzy c-means algorithm by at least four times.

The third paper by Yu et al. is entitled “On-chip real-time feature extraction using semantic annotations for object recognition”. This paper presents an on-chip feature extraction named semantics-based vague image representation (SVIR) to reduce the semantic gap of content-based image retrieval. It is shown that the SVIR representation does not involve complicated calculations enabling its on-chip design to reach real-time throughput without making use of a high-speed clock. The performance results of implementing SVIR using an FPGA platform are also provided in the paper.

The fourth paper by Wu et al. is entitled “Optimization of minimum volume constrained hyperspectral image unmixing on CPU–GPU heterogeneous platform”. This paper proposes a parallel approach for minimum volume constrained hyperspectral image unmixing on a CPU–GPU heterogeneous platform. The proposed approach takes advantage of the parallel processing capabilities of GPU and the logic control capabilities of CPUs. The experimental results indicate that the proposed approach is more accurate and robust than the traditional approach with a speedup of more than 50 times.

The fifth paper by Jakovljevic et al. is entitled “New access modes of parallel memory subsystem for sub-pixel motion estimation”. This paper introduces a block mode and

Fig. 2 Editorial board meeting (April 2018); from left to right: Nasser Kehtarnavaz, Ruby Medrubeoglu, Mohamed Akil, Christos Grecos, Matthias Carlsohn, Bogdan Smolka, Sergio Saponara, Mukul Shirvaikar



a row access mode for parallel memory systems to achieve a higher processing throughput and a lower energy consumption by exploiting spatial overlaps of accessed blocks/rows. The advantages of the introduced modes are demonstrated both analytically and experimentally on a case study involving sub-pixel motion estimation for video frame-rate conversion leading to 40–70% higher processing throughput and 17–44% lower energy consumption.

The sixth paper by Gonzalez et al. is entitled “A novel FPGA-based architecture for the estimation of the virtual dimensionality in remotely sensed hyperspectral images”. This paper covers the first FPGA design for the Har-sanyi–Farrand–Chang virtual dimensionality (HFC-VD) algorithm. The implementation is carried out on a Virtex-7 XC7VX690T FPGA and testing is done using real hyperspectral data. The experimental results demonstrate that the hardware implementation significantly outperforms an equivalent software version.

The seventh paper by Concha et al. is entitled “Performance evaluation of a 3D multi-view-based particle filter for visual object tracking using GPUs and multicore CPUs”. This paper provides an extensive performance analysis of the particle filter (PF) algorithm for a computationally intensive 3D multi-view visual tracking application. Different implementations and parameter settings of the PF algorithm are compared on a multithreaded CPU platform and a GPU platform using the NVIDIA CUDA computing environment. It is shown that the GPU platform outperforms the multithreaded CPU platform when handling a large number of particles.

The eighth paper by Usamentiaga et al. is entitled “Efficient registration of 2D points to CAD models for real-time applications”. This paper provides an efficient registration procedure of 2D points to computer-aided design (CAD). After reviewing the previous papers in terms of accuracy, speed and robustness, computationally efficient computations are presented in the paper including an estimation of the rigid transform, a computation of the closest point to geometric primitives, and an estimation of the surface normal. It is indicated that the proposed registration procedure achieves accurate registration in less than 1 ms.

The ninth paper by Barina et al. is entitled “Vectorization and parallelization of 2-D wavelet lifting”. This paper examines several SIMD-vectorized algorithms for 2-D discrete wavelet transform using a lifting scheme. It is shown that the proposed algorithms scale almost linearly with the number of threads. A number of platforms are considered in the experimentations indicating that these algorithms are considerably faster than the existing ones.

The tenth paper by Roy et al. is entitled “A parallel LEGION algorithm and cell-based architecture for real-time split and merge video segmentation”. This paper offers a parallel algorithm of splitting and merging which depends only on local operations. The algorithm is then mapped onto a hierarchical cell network. The simulation results show that the proposed design is faster than standard split and merge algorithms without compromising segmentation quality. In addition, a live PAL video segmentation using VIRTEX 5 series FPGA is demonstrated in the paper. The design is also extended to HD resolution for which the time taken is less than 5 ms resulting in a processing throughput of 200 fps.

The eleventh paper by Quevedo et al. is entitled “Super-resolution with selective filter based on adaptive window and variable macro-block size”. This paper discusses a selective filter to decide the best low-resolution frames in the super-resolution process. Additionally, a variable block size technique with an adaptive macro-block size is discussed. Comparison results are provided between bilinear interpolation, baseline super-resolution, and the proposed approach in terms of peak signal-to-noise ratio (PSNR) and Structural SIMilarity (SSIM) index. It is shown that the proposed approach significantly speeds up the computation time as compared to the previous approaches.

The twelfth paper by Li et al. is entitled “Design and evaluation of a parallel and optimized light–tissue interaction-based method for fast skin lesion assessment”. This paper focuses on the optimization of a C-based Parallel and Optimized Kubelka–Munk Genetic Algorithm (named PO-KMGA) using KM model optimized re-writing, parallelized threads, and memory optimization and routine pipelining with Intel C++ compiler. The experimental results demonstrate that the introduced PO-KMGA algorithm takes less than 10 min to finish tasks that the conventional KMGA takes about 2 days to finish while achieving a similar performance.

The thirteenth paper by Mondal et al. is entitled “Efficient computation of cross-sections from human brain model by geometric processing”. This paper presents an efficient method for computing cross-sections of the internal structure from a 3D human brain model. A doubly connected edge list (DCEL) is used to speed up the computation during geometric processing. The optimal distance between two successive sectional planes is determined from the frequency distribution of the edge lengths. It is demonstrated that the proposed method reduces the computation time without compromising the output quality.