Optical Engineering

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Nowadays, we cannot imagine our life without video content and without devices that enable us to acquire and display such content. According to recent research, in 2012, the video content transfer over the Internet was around 60% of the overall Internet data transfer, and the overall video transfer (including the Internet) could reach 90% during the next four years. The TV sets supporting only full high-definition (HD) resolution (i.e., 1080p) are already considered to be outdated due to a dramatic demand for the ultra-HD resolution that often refers to 3840×2160 (4K) or 7680×4320 (8K) resolutions. So, what are the key factors for such tremendous progress? If you are reading this special section on video compression technology, we are sure that you know the answer...

This *Optical Engineering* special section attempts to provide an overview of the recent achievements in video compression technology, with articles written by professionals and experts in this field. Particularly, this special section consists of eight articles, which can be divided into four groups.

The first group of articles consists of three papers and addresses various issues related to the H.264/MPEG-4 AVC video coding standard, particularly with regard to the video decoding process. The article "Optimal complexity scalable H.264/AVC video decoding scheme for portable multimedia devices" by H. Lee et al. presents a complexity-scalable H.264/MPEG-4 AVC-based video decoding scheme, thereby enabling control over decoding computational complexity in a scalable manner. Also, the article "Enhanced low bitrate H.264 video coding using decoder-side super-resolution and frame interpolation" by H. F. Ates offers a decoder-side super-resolution (SR) and motion-compensated frame interpolation (MCFI) algorithms for improving the H.264/MPEG-4 AVC coding efficiency. In addition, a fast decoding method is proposed for the context-adaptive variable length coding (CAVLC) by D. W. Ki and J. H. Kim in the article "Fast multiple *run_before* decoding method for efficient implementation of an H.264/AVC context-adaptive variable length coding decoder."

The second group contains an article titled "Spatial and interlayer hybrid intra-prediction for H.264/SVC video" by C.-S. Park, which relates to the scalable extension of the H.264/MPEG-4 AVC video coding standard, i.e., to the scalable video coding (SVC) standard. In his work, Park aims to improve the intra-prediction performance by adaptively exploiting the spatial correlation as well as the interlayer correlation between the SVC base layer (BL) and the SVC enhancement layers (EL).

The third group of articles consists of two papers that relate to the high-efficiency video coding (HEVC) standard, the first edition of which was officially finalized in January 2013. According to many recent studies, the HEVC standard is capable of providing a bit-rate reduction of about 50% at the same visual quality compared to its predecessor, the H.264/MPEG-4 AVC standard. On this topic, J. Xiong, in his article titled "Fast coding unit selection method for HEVC intra-prediction," presents a method for determining an appropriate HEVC coding unit (CU) size to reduce computational complexity of the intra-coding process. Also, in the article titled "Edge-preserving down/upsampling for depth map compression in high-efficiency video coding," H. Deng et al. present a method for efficiently compressing depth maps within the HEVC-based framework by considering edge similarities between depth maps and their corresponding texture images, as well as the structural similarity among the depth maps.

The fourth group of articles consists of two papers, which mainly address the video communication and error-resilience field. J. Lee et al., in the article titled "Constrained in-loop filtering for error resiliency in high-efficiency video coding," propose constrained in-loop filtering to protect intra-coded samples from error preparation by adaptively applying filters, depending on prediction modes of reconstructed blocks. Furthermore, L. Qing et al. present a framework for optimizing video communication quality, based on the distributed video coding (DVC) in practical lossy network scenarios, in the article titled "Practical distributed video coding in packet lossy channels."

Although it is not possible in a single special section to provide a comprehensive overview of all advances in so huge a field as video compression, we are confident that the articles published in this special section offer a good reflection of recent developments in video compression technology.

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Dan Grois received a PhD degree at the Communication Systems Engineering Department, Ben-Gurion University of the Negev (BGU), Israel, in 2011. From 2011 to April 2013, he was as a senior researcher at the Communication Systems Engineering Department, BGU. Starting from May 2013, he is a postdoctoral senior researcher at the Fraunhofer Heinrich Hertz Institute (HHI), Germany. He has a significant number of publications that have been presented at peer-reviewed international conferences and published in various scientific journals and books. In addition, he is a referee of top-tier conferences and international journals, such as *IEEE Trans. on Image Processing*, *IEEE Trans. on Multimedia*, *IEEE Trans. on Signal Processing, J. of Visual Comm. and Image Repres.*, *Sensors J.*, *Optical Engineering*, etc. During his academic carrier, he was granted various fellowships, including the Kreitman Fellowships and the Alain Bensoussan Fellowship. In addition, he is a Marie Curie Fellow, a Senior Member of the IEEE, and a Member of the ACM and SMPTE societies. His research interests include image and video coding and processing, video coding standards, region-of-interest scalability, computational complexity and bit-rate control, network communication and protocols, and future multimedia applications/systems.

Ofer Hadar received BSc, MSc (cum laude), and PhD degrees from the Ben-Gurion University of the Negev, Israel, in 1990, 1992, and 1997, respectively, all in electrical and computer engineering. The prestigious Clore Fellowship supported his PhD studies. His PhD dissertation dealt with the effects of vibrations and motion on image quality and target acquisition. From August 1996 to February 1997, he was with CREOL at Central Florida University, Orlando, as a visiting research scientist, working on angular dependence of sampling modulation transfer function (MTF) and over-sampling MTF. From October 1997 to March 1999, he was a postdoctoral fellow in the Department of Computer Science at the Technion-Israel Institute of Technology, Haifa. In 1999 he joined the Communication Systems Engineering Department at Ben-Gurion University of the Negev. Currently, he is an associate professor and the head of the department. His research interests include image compression, advanced video coding, H.264, SVC, packet video, transmission of video over IP networks, and image processing. Since 2011, he is an associate editor of *Optical Engineering*. He also works as a consultant of various hi-tech companies in Israel, and is a Senior Member of IEEE and SPIE.