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A review on low-complexity video compression with compressive sensing-based approaches

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Wireless multimedia sensor networks (WMSNs) have been potentially applicable for several emerging applications. The resources (e.g., power and bandwidth) available to visual sensor nodes (VSNs) in a WMSN are, however, very limited. Therefore, it is important but challenging to achieve efficient resource allocation and optimal multimedia data compression while maximizing the overall network lifetime. To achieve this, low-complexity and high-efficiency video encoding equipped in each VSN is one essential issue, which is the focus in this paper. In this paper, a review and comparative study on low-complexity video compression are presented. Current video compression standards (e.g., H.264/AVC or H.265/HEVC) usually perform complex inter-frame encoding based on motion estimation with high computational complexity, which will consume a significant portion of the total power consumption for a VSN. Recently, several "motion estimation-free" low-complexity video encoding approaches have been proposed, which may be roughly classified into the following categories: (1) Still image-based or standard codec-based low-complexity video compression: without performing motion estimation, the most straightforward way is to apply still-image/intra-frame encoding to each video frame individually; (2) collaborative video compression and transmission: To further increase compression efficiency, inter-view correlation among VSNs may be exploited via collaborative video compression and transmission; and (3) distributed video coding (DVC): the unique characteristic is that individual frames are encoded independently, but decoded jointly. The major encoding burden, i.e., motion estimation, can be shifted to the decoder while preserving a certain coding efficiency. Recently, a novel compression platform based on the compressive sensing (CS) theory has been highly popular and applicable to image and video signal acquisition and compression. A unique characteristic is that CS can "directly" capture compressed video data without temporally storing the raw data, resulting in very low complexity compression. Relying on the sparsity of video data, video construction can be achieved at the decoder. In this paper, we also present an overview of our pioneer CS-based video compression framework, called distributed compressive video sensing (DCVS) as well as the comparative study among our framework and some significantly recent approaches inspired by our work.

Biography

Li-Wei Kang received his BS, MS, and PhD degrees in Computer Science from National Chung Cheng University, Chiayi, Taiwan, in 1997, 1999, and 2005, respectively. Since February 2013, he has been with the Graduate School of Engineering Science and Technology-Doctoral Program, and the Department of Computer Science and Information Engineering, National Yunlin University of Science and Technology, Yunlin, Taiwan, as an Assistant Professor. Before that, he worked for the Institute of Information Science, Academia Sinica (IIS/AS), Taipei, Taiwan, as an Assistant Research Scholar during 2010–2013, and as a Post-doctoral research fellow during 2005–2010. His research interests include multimedia content analysis and multimedia communications

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