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Guest Editorial

The successful development of video-based services and applications in mobile environments requires adopting integrative approaches that jointly address video signal processing and networking issues. Multimedia data characteristics, coding standards and functionalities, as well as network protocols performance and channel behavior are some of the key aspects that need to be carefully examined in the design of new mobile communication applications that will enable video telephony, interactive gaming, digital television, or immersive communications in virtual environments, for example. Recent advances in video processing and coding (e.g. H.264 and Scalable Video Coding), jointly with novel networking protocols and technologies such as IEEE 802.11 (infrastructured, mesh, and sensor networks), 802.15, 802.16, UWB, DVB-H, Bluetooth, Mobile IP and its variants, lay the ground for the development of new and efficient mobile video services.

This Special Issue reports the results of recent advances in the field by presenting a collection of articles that address problems related to coding, signal processing, transmission, protocols, for robust and efficient video delivery over wireless and mobile communication channels. Some of these papers are extensions of papers that were presented at the Mobile Multimedia Communications Conference (MobiMedia 2006) that was held in Alghero, Italy.

The first paper of the special issue is entitled "Real-Time Multimedia Processing in Video Sensor Networks (VSN)", and authored by Yaoyao Gu, Yuan Tian, and Eylem Ekici. It investigates the problems of in-network processing, task mapping and scheduling in VSN, and presents an application-independent solution in multi-hop VSNs. The proposed algorithm provides real-time guarantees to process video feeds and schedules communication and computation tasks of an application with minimum energy consumption, subject to delay constraints. It is based on the high-level application model that describes applications through a Directed Acyclic Graph (DAG), which can be used to represent arbitrary applications, and a novel communication model for multi-hop wireless networks. The second paper "Multiple Description Video Coding using Coefficients Ordering and Interpolation", by Nicola Conci and Francesco G.B. De Natale, presents a new algorithm for video coding in multiple description streams. The method works in the DCT domain, and associates each descriptor with two data sources: a subset of the original transform coefficients, and side information concerning the position and magnitude of the remaining coefficients. The main advantage of this algorithm is that, when one or more descriptors are partially lost, the decoder is able to interpolate the missing coefficients on the basis of the side information, alleviating the quality loss due to the missing data. The effectiveness of the proposed approach is greatly enhanced by the use of a JPEG-like syntax and an efficient 3D-VLC algorithm for the encoding of the overhead information. This choice makes also easier and natural the integration of the MDC scheme in most DCT-based standard encoders such as M-JPEG and MPEG-1/2. The following paper is entitled "Perceptually Adaptive Joint Deringing–Deblocking Filtering for Scalable Video Transmission over Wireless Networks", and authored by Shuai Wan, Marta Mrak, Naeem Ramzan, and Ebroul Izquierdo. This paper considers the problem of video transmission over low bit-rate channels, which requires dedicated filtering during decoding for crucial enhancement of the perceptual video quality, in particular, deringing and deblocking. The main novelty of the paper is a perceptually adaptive joint deringing–deblocking filtering technique for scalable video streams. It considers both prediction and update steps in motion compensated temporal filtering in an in-loop filtering architecture, and integrates three different filtering modules to deal with low-pass,

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high-pass and after-update frames, respectively. The filter selectivity is adaptively tuned according to the number of discarded bit-planes, which in turn depends on the channel bit-rate and the channel error conditions. In the paper "Adaptive Error-Resilience Transcoding using Prioritized Intra-Refresh for Video Multicast over Wireless Networks" by Chih-Ming Chen, Chia-Wen Lin, and Yung-Chang Chen, the authors propose a two-pass error-resilience transcoding scheme for inserting error resilience features to a compressed video at the intermediate transcoder of a three-tier streaming system. The transcoder adaptively adjusts the intra-refresh rate according to the video content and the packet loss rate on the transmission channel, in order to protect the most important macroblocks against packet loss. The paper also considers the problem of video multicast with multiple clients having disparate channel loss profiles and propose a MINMAX loss rate estimation scheme to determine a single intra-refresh rate for all the clients in a multicast group. The fifth paper is entitled "Bit-stream Allocation Methods for Scalable Video Coding Supporting Wireless Communications" and is authored by Toni Zgaljic, Nikola Sprljan, and Ebroul Izquierdo. This article deals with the problem of bit-stream allocation in scalable wavelet-based video coding. Two methods are proposed: the first method assumes that minimum rate-distortion (R-D) slope of the same fractional bit-plane within the same bit-plane across different subbands is higher than or equal to the maximum R-D slope of the next fractional bit-plane. In the second method, the distortion caused by quantization of the wavelet coefficients is considered and a simple yet effective statistical distortion model is derived for estimation of R-D slopes for each fractional bit-plane. The sixth paper is entitled "Cross-layer Architecture for Scalable Video Transmission in Wireless Network" and is authored by J. Huusko, J. Vehkapera, P. Amon, C. Lamy-Bergot, G. Panza, J. Peltola, and M.G. Martini. The authors propose a cross-layer architecture for joint source channel coding (JSCC/D) system to transmit the control information and to optimize the multimedia transmission over wireless and wired IP networks. The work is based on network transparency and cross-layer information exchange, which make the underlying network infrastructure almost invisible to all entities involved in the system. The primary goal is to transfer cross-layer control information through the IP network, in a transparent manner, in spite of strict rules of the OSI model. The seventh article is a short paper entitled "A Power-based Unequal Error Protection System for Digital Cinema Broadcasting over Wireless Channels", and authored by Maurizio Murroni. This paper deals with the efficient and robust wireless broadcasting of JPEG2000 Digital Cinema streams from studios to theatres. It proposes a FEC-UPA (Forward Error Correction—Unequal Error Protection) system that adopts the resilience tools of the JPEG2000 wireless standard. The JPEG2000 stream is partitioned into a certain number of packet groups to which light FEC coding is applied. Groups are then transmitted through separate Wavelet Packet Division Multiplexing (WPDM) sub-channels at different power. Both stream partitioning and UPA are driven by the sensibilities of the JPEG2000 packets to the channel errors. The eighth article is a short paper entitled "Unequal Error Protection and Progressive Decoding for JPEG2000", and authored by Lingling Pu, Michael W. Marcellin, Bane Vasic and Ali Bilgin. It presents an unequal error protection scheme for still and motion image transmission. The underlying channel codes are created using a Plotkin construction and offer the novel ability of using one long channel codeword to protect an entire image, yet allowing progressive decoding. Progressive quality improvements occur in two ways: the first is the usual progressive refinement, where image quality is improved as more data are received; the second is that residual error rates of earlier received data are reduced as more data are received.

We hope that the reader will enjoy the interesting research works selected for this special issue and that he will find appealing hints for future explorative activities on the broad field of mobile multimedia communications. We would also like to thank the authors for submitting their work to this special issue and express their special thanks to all reviewers for their essential help in providing experts comments on the numerous papers submitted to this special issue. Finally, we would like to express our gratitude to the Editor-in-Chief, Prof. Murat Tekalp for making this special issue possible.

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