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Editorial
Multimedia over Wireless Networks

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In recent years,there has been a tremendous increase in demand for multimedia delivered over wireless networks.The design and capabilities of the mobile devices and the services being offered reflect the increase in multimedia usage in the wireless setting. Applications that are in the process of becoming essential to users include video telephony, gaming, or TV broadcasting. This trend creates great opportunities for identifying new wireless multimedia applications, and for developing advanced systems and algorithms to support these applications. Given the nature of the channel and of the mobile devices, topics such as scalable multimedia coding, error resilience, and energy-efficient operation are of great importance. The papers in this issue focus on state-of-the-art research on several aspects of wireless multimedia communications.

The first paper of R. Razavi et al. proposes an adaptive modulation scheme to support higher-quality video streams for Bluetooth-enhanced data rate wireless channel. The scheme is based on (1) the content type at the video frame level and (2) the content importance at the macroblock level, to reduce the impact of radio frequency noise and interference. Because the bit-rate of the protected data is reduced, the paper proposes buffer management to reduce the risk of buffer overflow. Unequal protection in Bluetooth streaming is shown to achieve a significant improvement in delivered video quality over the best fixed bit-rate schemes according to cross-traffic conditions. In terms of delivered video quality, the proposed UEP scheme also consistently outperforms a classic Bluetooth CQDDR scheme in which the data rate is adjusted according to channel conditions, though without consideration of packet content. The paper demonstrates that an unequal protection scheme ought to be dynamic, as the content importance characteristics change within a video sequence. The scheme introduced accounts for a varying ratio of frame-type sizes and of intracoded macroblocks arising from the occurrence of scene changes, rapid motion, camera pans, zooms, and so forth.

The second paper by S. Gupta et al. introduces a modified isochronous coordination function for the enhancement of the VoIP call capacity over IEEE 802.11 wireless local area network (WLAN). VoIP over IEEE 802.11 is growing very fast and is providing a cost-effective alternative for voice communications. WLANs were initially set up to handle bursty non-real-time type of data traffic. Therefore, the wireless access protocols initially defined are not suitable for voice traffic. Subsequently, updates in the standard have been made to provision for QoS requirements of data, especially for real time traffic of voice and video data. However, despite these updates, transmitting voice traffic over WLAN does not utilize the available bandwidth (BW) efficiently, and the number of simultaneous calls supported in practice is significantly lower than what the BW figures would suggest. Several modifications have been proposed to improve the call capacity, and recently the isochronous coordination function (ICF) was introduced to mitigate the problem of low call capacity. In this paper, the authors propose a modified ICF which further improves the performance in terms of the call capacity. The proposed scheme uses multiplexing and multicasting in the downlink to substantially increase the call capacity.

In the third paper, D. S. Nursimlo et al. propose an integrated mobility scheme that combines the procedures of the fast handover for mobile IPv6 (FMIPv6) and the session initiation protocol (SIP) mobility for real-time communications. This integrated approach is based on the context of the applications utilized. Furthermore, to reduce system redundancies and signaling loads, several functionalities of FMIPv6 and SIP have been integrated to optimise the integrated mobility scheme. The proposed scheme aims at reducing the handover latency and packet loss for an ongoing

real-time traffic. Using ns-2 simulation, the authors demonstrate that the proposed mobility architecture achieves lower handover delay and less packet loss than using either FMIPv6 or SIP and hence presents a powerful handover mobility scheme for next-generation IP-based wireless systems.

In the fourth paper, A. Fernandez-Duran et al. propose a dimensioning method for conversational video applications in wireless convergent networks. The raise of such new convergent services is due to the expansion of IP networks based on the availability of innovative advanced coding formats such as H.264, which reduce network bandwidth requirements providing good video quality, and the rapid growth in the supply of dual-mode WiFi cellular terminals. This paper presents a new and simple dimensioning model of conversational video over wireless LAN. WLAN is addressed under the optimal network throughput and the perspective of video quality. The maximum number of simultaneous users resulting from throughput is limited by the collisions taking place in the shared medium with the statistical contention protocol. The video quality is conditioned by the packet loss in the contention protocol. Both approaches are analyzed within the scope of the advanced video codecs used in conversational video over IP, to conclude that conversational video dimensioning based on network throughput is not enough to ensure a satisfactory user experience, and video quality has to be taken also into account.

O. Crave et al. address the problem of multimedia communications over best-effort networks with multiple description coding (MDC) in a distributed framework. In this fifth paper, the authors first compare four video MDC schemes based on different time splitting patterns and two- or three-band motion-compensated temporal filtering (MCTF). Then, the latter schemes are extended with systematic lossy description coding where the original sequence is separated into two subsequences, one being coded as in the latter schemes, and the other being coded with a Wyner-Ziv (WZ) encoder. This approach leads to satisfactory rate-distortion performance at the side decoders; however, it suffers from high redundancy which penalizes the central description. To cope with this problem, the approach is then extended to the use of MCTF for the Wyner-Ziv frames, in which case only the low-frequency subbands are WZ-coded and sent in the descriptions.

The next papers are steered by a power-aware optimization of the multimedia communication system. Since one of the most impending requirements to support a seamless communication environment in heterogeneous wireless networks comes from the limited power supply of small-size and low-cost mobile terminals as in stand-alone WLANs or cellular networks, S. Lee et al. propose in the sixth paper a power-efficient communication protocol (PCP) for integrated WWAN and WLAN. This protocol includes turning off the WLAN interface after it enters the idle state and using the paging channel of WWAN in order to wake up the WLAN interface when there is incoming long-lived multimedia data. Further, the proposed scheme is designed to avoid repeatedly turning on and off WLAN interfaces, which consumes a significant amount of power. The tradeoffs between the power saving and the number of packets dropped at the buffer are investigated analytically through the study of an on/off traffic model. Simulation results for scenarios of interest are additionally provided.

The seventh paper by E. Salami et al. describes a methodology to optimize a turbo-encoded wavelet-based satellite downlink progressive image transmission system with unequal error protection (UEP) techniques. To achieve that goal, a generic UEP methodology is instantiated onto the system. It is demonstrated that the proposed solution has little impact on the average performance, while it significantly reduces the run-time complexity. Based on a simple design-time distortion model and a low-complexity run-time algorithm, the provided solution can dynamically tune the system's configuration to any bit-rate constraint or channel condition.

Finally, the last paper by X. Ji et al. considers the problem of packet scheduling for the transmission of multiple video streams over a wireless local area network (WLAN). A cross-layer optimization framework is proposed to minimize the wireless transceiver energy consumption while meeting the user-required visual quality constraints. The framework relies on the IEEE 802.11 standard and on the embedded bit-stream structure of the scalable video coding scheme. It integrates an application-level video quality metric as QoS constraint (instead of a communication layer quality metric) with energy consumption optimization through link layer scaling and sleeping. Both energy minimization and min-max energy optimization strategies are discussed. Simulation results demonstrate significant energy gains compared to the state-of-the-art approaches.

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