Hindawi Publishing Corporation
EURASIP Journal on Advances in Signal Processing
Volume 2008, Article ID 749159, 2 pages
doi:10.1155/2008/749159

Editorial

Introduction to the Special Issue on Wireless Video

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Received 1 July 2008; Accepted 1 July 2008

Mobile communications, the Internet, and other emerging consumer technologies continue to have a major impact on our personal and business lives. Increasing numbers of media centric devices now have integrated wireless functionalities, and video-based services are becoming increasingly important. However, longer-term adoption of wireless video will hinge on a number of issues: the business model (does it make money?), the content (do we want to watch it?), the terminal capability (is the display bright enough and the battery life long enough?) and, not least, accessibility and visual quality (is it watchable?). This critical latter area is the topic of this special issue.

Because of its large bandwidth requirements, coupled with increased demand, video will become the dominant and most critical form of traffic in and beyond 3G/4G wireless systems. Reliable digital video transmission over wireless connections is widely acknowledged as challenging, given the hostile communication environment which is characterised by unpredictable connection quality, variable delay, significant error rates, limited available bandwidth, and severe energy constraints. These are compounded by the very nature of video information which, when compressed, is inherently sensitive to bit and packet losses.

When developing a reliable video transmission system for operation over a wireless network, many varied and interacting technical problems must be addressed, some of which may be application or standard specific. Many of these issues are addressed in the 12 papers contained in this special issue. The papers broadly fit into three categories: (i) error-resilient video and cross-layer optimisation, (ii) quality assessment, and (iii) the impact of the wireless channel and network. Due to the nature of the subject, however, several of the papers cut across more than one category.

The first 5 papers deal with error-resilience and cross-layer optimisation. The first paper by Pierre Ferré et al. addresses the issue of cross-layer optimisation for enhanced quality transmission over wireless LANs. A novel link adaptation scheme is presented that improves the quality of service (QoS). Rather than maximising the error-free throughput, this minimises the video distortion of the received sequence enabling the system to select the link speed which offers the lowest distortion and to adapt to varying channel conditions. The second paper by Hyungkeuk Lee et al. presents a cross-layer approach to improve video quality in an MIMO system. This is based on unequal error protection, where the coding strength is dictated by visual importance. The paper by Zhu Li et al. focuses on the issue of video transmission over a severely impaired, bandwidth-limited channel, taking into account battery life. The approach is based on the joint optimisation of video summarisation, coding, modulation, and packetisation, demonstrating substantial advantages under these constraints.

Scalability is an important codec characteristic which can be exploited to define new scheduling and prioritisation algorithms for the efficient delivery of time-sensitive video traffic. The paper by Max Agueh et al. presents an optimised FEC scheme which is JPEG2000 compliant and which provides an important step towards providing QoS guarantees in JPEG2000-based wireless multimedia systems. Following this, the paper by Nicolas Tizon and Béatrice Pesquet-Popescu exploits the properties of H.264/SVC in the context of a wireless network. Their approach combines temporal and SNR scalability features with an intelligent packet scheduling strategy to achieve substantial quality gains over convention approaches.

The next two papers deal with the crucial issue of picture quality. The contribution by Pasquale Pace and Emanuele Viterbo proposes a method for assessing the perceived quality of streaming media taking into account both loss and bandwidth. Based on VQM, the approach correlates well

with subjective assessments and can offer real-time quality assessment and adaptation. From a practical viewpoint, the second paper by Heidi Himmanen et al. addresses the assessment of video quality in the context of streaming DVB-H services to mobile handhelds. Their results demonstrate the shortcomings of existing approaches and help to lay the foundations for future objective criteria.

The final five papers focus on specific aspects of the wireless physical layer, MAC, or network and how these impact video transmission. The first contribution by Alfonso Fernandez Duran et al. deals specifically with low-latency video services, addressing the impact of wireless handover on latency. The paper demonstrates that improved performance can be obtained through the use of alternative decision thresholds. Julie Neckebroek et al. consider the merits of FEC an ARQ in the context of a wireless Rayleigh fading link. They analyse the diversity gain offered by FEC and ARQ in terms of fading parameters, latency, and transmission overhead and apply their results to the case of an indoor 60GHz HDTV link. The paper by Chi-Huang Shih et al. introduces a transparent loss recovery scheme based on a transparent end-to-end QoS mechanism and an instantaneous frame-level FEC allocation technique, which provides near optimal performance with low delay. Rouzbeh Razavi et al. address the issue of power constraints in a Bluetooth network. They propose fuzzy logic as a means of controlling ARQ in the context of packet delay deadlines and buffer management. Finally, Saeid Montazeri et al. propose a new distributed QoS (MAC scheduling) scheme for WLANs which is capable of dealing with both CBR and VBR traffics in terms of delay and throughput.

ACKNOWLEDGMENTS

The guest editors hope you enjoy this special issue and would like to thank all the authors who have contributed to it. In addition, special thanks go to all the reviewers who have donated their valuable time to inform the decision process and to provide constructive feedback to the authors.

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