Real-Time Imaging 7, 219–220 (2001)
doi:10.1006/rtim.2001.0263, available online at http://www.idealibrary.com on IDEAL®

Guest Editorial: Adaptive Real-Time Multimedia Transmission over Packet Switching Networks

Real-time multimedia transmission over packet switching networks requires strict guarantees of network bandwidth and several quality of service (QoS) parameters, such as end-to-end delay, delay variation and packet loss. Unfortunately, most of the current packet switching networks, such as the Internet, do not provide such guarantees. The available bandwidth of these networks varies dynamically depending on the congestion level within the network. However, in the case of adaptive multimedia applications which can tolerate graceful degradation of audio or video quality as a result of network congestion, bandwidth of the media stream can be scaled down to provide a degraded audio or video quality at the destination. A number of schemes to adapt the media rate have been studied in the literature for both real-time and precoded media.

Adaptation of multimedia applications can be done at several layers of the network protocol stack. At the physical layer, adaptive power control techniques can be used to mitigate variations in a wireless environment. At the data link layer, error control and adaptive reservation techniques can be used to protect against variation in error and available rate. At the network layer, dynamic re-routing mechanisms can be used to avoid congestion and mitigate variations in a mobile environment. At the transport layer, dynamic re-negotiation of connection parameters can be used for adaptation. Applications can use protocols such as Real-Time Streaming Protocol (RTSP) and Real-Time Protocol (RTP). At the application layer, the application can adapt to changes in network conditions using several techniques including hierarchical encoding, efficient compression, bandwidth smoothing, rate shaping, error control, and adaptive synchronization. The aim of this Special Issue is to bring together survey and original work on the techniques that have been developed to scale audio or video streams to allow continuous operation of adaptive multimedia applications.

In the first paper by Vandalore, Feng, Jain and Fahmy, the authors have carried out a comprehensive survey of the various techniques to use feedback from lower networking layers by application layer to adapt to changing networking conditions. Such applications layer techniques include compression, application streaming, rate shaping, error control, adaptive synchronization and smoothing.

Conti and Gregori study bandwidth allocation schemes for the transmission of VBR video traffic with deterministic guarantees, i.e. no packet loss and no missed deadlines. They propose and investigate a policy which attempts to keep the quality of video constant by varying the transmission rate (constant quality), while the video quality transmission is reduced to cope with network congestion.

Zhang, Nelakuditi, Aggarwal and Tsang discuss techniques of selectively discarding frames of pre-stored video at the server during network congestion to obtain and optimal Quality of Service at the client. Packets may be lost in a network during periods of congestion. Nikoladis, Hasan and Marvasti discuss error resilient video codecs as an adaptation technique to recover from packet losses in an ATM network.

The paper by Mehaoua, Boutaba, Pu, Rasheed, and Leon-Garcia discusses techniques to transport video over an enhanced ATM UBR best effort service. They propose a new best effort ATM service for optimal transmission of video.

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The last paper by Hadar and Cohen proposes an algorithm to smooth out the burstiness of video traffic by dividing it into a number of intervals.

Before closing the editorial, we'd like to explicitly acknowledge the time and expertise of the following reviewers who helped us in maintaining a high quality for this Special Issue: Guojun Lu, Stuart Dunstan, Bin Qiu, Phillip Branch, Samar Sing, Jim Breen, Sid Ray, David Taubman, Mark Hedley, Jaga Indulska, Aruna Seneviratne, Harsha Sirisena, Shahadat Khan, Ahmet Sekercioglu, Gamze Seckin, Pedro Cuenca, Luis Orozco Barbosa, and Naoto Matoba.

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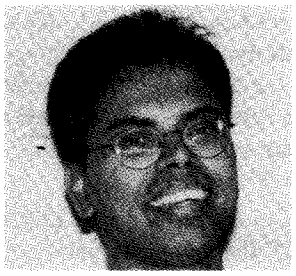

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