NJIT

IEEE North Jersey Communications Chapter

Optimal Video Stream Multiplexing through Linear Programming*

by Ofer Hadar, Ben Gurion University of the Negev

Date: April 24, 2003 (Thursday)
Time: 6:15 pm (refreshment starts at 6:00 pm)
Place: 202 ECEC, NJIT

About the Speaker

Ofer Hadar received the B.Sc., the M.Sc. (cum laude) and the Ph.D. degrees from the Ben-Gurion University of the Negev, Israel, in 1990, 1992, and 1997, respectively, all in electrical and computer engineering. The prestigious Clore Fellowship supported his Ph.D. studies. His Ph.D. dissertation dealt with the effects of vibrations and motion on image quality and target acquisition. From August 1996 to February 1997, he was with CREOL at Central Florida University, Orlando, FL, as a Research Visiting Scientist, working on angular dependence of sampling MTF and over-sampling MTF. From October 1997 to March 1999, he was Post-Doctoral Fellow in the Department of Computer Science at the Technion-Israel Institute of Technology, Haifa. Currently he is a senior lecturer at the Communication Systems Engineering Department at Ben-Gurion University of the Negev. His research interests include: image compression, video compression, video transcoding, packet-video, transmission of video over IP networks and, video rate smoothing and statistical multiplexing. Hadar also works as a consultant to ***Scopus*** Ltd. in the area of video compression, video Transcoding, and efficient Multiplexing of several video streams over satellite network. He is a member of IEEE and SPIE.

About the Talk

Rapid advantages in computer and telecommunication technologies have made integrated services packet-switched networks possible. It is expected that a significant portion of future networks will carry prerecorded video. Traffic in applications such as *Video on Demand* (VoD), will include high-fidelity audio, short multimedia clips, and full-length movies. In this talk I present different solutions for efficient multiplexing of several video streams with *Variable Bit Rate* (VBR), on a Constant Bit Rate (CBR) channel. The porpuse of these schemes is to maximize the number of streams transmitted simultaneously, such that the end users receive satisfactory service. I emphasis my talk on two solutions, *video rate smoothing* and *statistical multiplexing* with transcoding. An *enhancement of the Piecewise Constant Rate Transmission and Transport* (PCRTT) algorithm for reducing the burstiness of a video stream based on smoothing constant intervals is presented. In this talk I also present a new optimal multiplexing scheme for compressed video streams based on a piecewise linear approximation of the accumulative data curve of each stream. A linear programming algorithm is proffered, which takes into account different constraints of each client. It is shown that the algorithm succeeds in obtaining maximum bandwidth utilization with Quality of Service (QoS) guarantees. The algorithm takes into account the interaction between the multiplexed streams and the individual streams, and simultaneously finds the optimum total multiplexed schedule and individual stream schedules that minimizes the peak transmission rate. In addition, the algorithm, due to the linear programming formulation, is bounded in polynomial time. The simulation results show a significant reduction in peak rate and rate variability of the aggregated stream, compared to the non-smoothing case. Therefore the proposed scheme allows an increase in the number of simultaneously served video streams.

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* This work is a joint research with Prof. Helman Stern from the Industrial Engineering Department at BGU.

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