

# Colorado State University

presents



## Dr. Ishfaq Ahmad

Computer Science and Engineering Department  
University of Texas at Arlington

### Abell Distinguished Lecture in Computer Engineering Joint Electrical and Computer Engineering Department and Computer Science Department Seminar

### “Power-Aware High-Performance Computing: The Dawn of a New Era”

Monday, October 8, 2007

Reception 10:30 am

Lecture 11:00 am to 12:00 noon

Lory Student Center room 230

#### ABSTRACT

Energy is one of the most valuable and scarce resources, a major portion of which is now being consumed to power up computers and their accessories. We address several research issues in power-aware computing at various levels, such as system, software, and applications. Power-awareness is an essentially important issue in pervasive environments due to battery constraints. We focus on video compression, which due to its intensive computational requirements can quickly deplete a battery. The theoretical basis of current video compression technologies is the quintessential R-D (rate-distortion) model that epitomizes the non-linear relationship between distortion and target bit rate. The model allows a video encoder to allocate bits to the compressed video so as to minimize the predicted distortion function given a bit rate constraint--the higher the bit rate, the lower the distortion, and vice versa. In this talk, we introduce a new paradigm of video encoding to develop "smart" (for the lack of a better word) but highly efficient video encoders. We propose a theoretical P-R-D (power-rate-distortion) model that facilitates the understanding of the interactions as well as tradeoffs between power, bit rate, distortion, and complexity. This in turn allows the encoder to apply optimization techniques for preserving the power while enhancing its visual quality. A software-based architecture is also proposed that allows the proposed techniques to be used in conjunction with MPEG and H.26X video coding standards.

**Dr. Ishfaq Ahmad** (<http://ranger.uta.edu/~iahmad/>) received a B.Sc. degree in Electrical Engineering from the University of Engineering and Technology, Pakistan, in 1985, and an MS degree in Computer Engineering and a PhD degree in Computer Science from Syracuse University, New York, U.S.A., in 1987 and 1992, respectively. He is currently a professor of Computer Science and Engineering at the University of Texas at Arlington (UTA). Prior to joining UT Arlington, he was on the faculty of the Computer Science Department of Hong Kong University of Science and Technology (HKUST). At HKUST, he also directed the Multimedia Technology Research Center, a university-wide research center that he conceived and established with other colleagues. At UTA, he leads the Multimedia Laboratory and Institute for Research in Security (IRIS). IRIS, an inter-disciplinary research center spanning several departments, is engaged in research on futuristic technologies for homeland security and law enforcement. Professor Ahmad is known for his research contributions in parallel and distributed computing, grid computing, multimedia computing, video compression, and security. His work in these areas is published in close to 200 technical papers in peer-reviewed journals and conferences, including three best paper awards at leading conferences and 2007 best paper award for IEEE Transactions on Circuits and Systems for Video Technology. His current research is funded by the Department of Justice (DOJ), National Science Foundation (NSF), and industry. He is an associate editor of the Journal of Parallel and Distributed Computing, IEEE Transactions on Circuits and Systems for Video Technology, IEEE Transactions on Multimedia, IEEE Distributed Systems Online, and Cluster Computing.

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