

# COMPUTER SCIENCE COLLOQUIUM

Department of Computer Science  
City University of Hong Kong  
and  
Hong Kong Web Society

## Pervasive Video Applications: Research Issues in Preserving the Battery Power, Bits and Visual Quality

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**Date :**

11 July 2006 (Tuesday)

**Time :**

11:00am - 12:00pm (Refreshment will be served at 10:45am)

**Venue :**

CS Seminar Room, Rm Y6405, 6th Floor Yellow Zone, Academic Building, City  
University of Hong Kong, Tat Chee Avenue, Kowloon Tong.

### Abstract

The theoretical basis of current compression technologies is the quintessential R-D(rate-distortion) model that defines a non-linear relationship between the distortion and target bit rate. This 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. While current compression technologies have had a significant impact on industry (DVD, HDTV, video conferencing systems, etc.), computing in general, and video applications in particular, are going through a paradigm shift. Computing is no longer confined to desktops, rather it is available in a pervasive fashion. The explosive growth of mobile devices, pledged by wireless networks and other enabling technologies, promise a future in which intensive information accompanied by content-rich video will proliferate. This revolution leads to a number of new research problems, such as the limited battery power available in mobile devices. In this talk we introduce a new paradigm in 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 study and understanding of the interaction as well as tradeoffs between power, bit rate, complexity, and distortion. In other words, the model relates distortion to bit rate as well as power, where the latter is mapped to the complexity of the encoder. A software-based video encoder architecture is proposed that allows the proposed techniques to be used in conjunction with all existing MPEG and H.26X video coding standards. The talk will also include an overview of various video related projects that we are pursuing.

### Biography

Dr. Ahmad 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). 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.

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 his senior colleague Professor Ming Liou. The center focused on core research as well as technology-transfer, and received sponsorship from the Government of the Hong Kong Special Administrative Region as well as industry. Comprising more than 40 personnel including faculty, postdoctoral fellows, full-time staff, and graduate students, the center collaborated with more than 70 industrial partners from Hong Kong, China, Europe, and U.S., contributed to MPEG, and licensed several technologies.

Professor Ahmad is known for his research contributions in scalable clusters, parallel and distributed computing and architectures, grid computing, pervasive multimedia computing, and video compression. His work in these areas is published in over 180 technical papers in peer-reviewed journals and conferences, including three best paper awards at leading conferences. His current research is funded by the Department of Justice (DOJ), National Science Foundation (NSF), and Sun Microsystems. He is an associate editor of Journal of Parallel and Distributed Computing, IEEE Transactions on Circuits and Systems for Video Technology, IEEE Concurrency, IEEE Distributed Systems Online, and Cluster Computing.

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*In case of questions, please contact Dr Qing Li at Tel: 2788 9695, E-mail: [itqli@cityu.edu.hk](mailto:itqli@cityu.edu.hk),  
or visit the CS Departmental Seminar Web at <http://www.cs.cityu.edu.hk/>.*