Electrical Engineering Colloquium
Dallas Chapter of IEEE Signal Processing Society Presents

Ubiquitous Multimedia Computing and Communication: Challenges and Future Trends

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With recent flourishing of embedded media applications (EMAs) such as MPEG-2, WMV and H.264 encoders/decoders and wireless broadband communication infrastructures such as 3G, WiMax and Wi-Fi, real-time multimedia computing and communications on embedded systems becomes a major focus for both software and hardware designers. Three important design issues will be considered in this talk. They are the increase of power efficiency of the SIMD architecture, the balance between flexibility and performance, and design automation. First, the pursuit of higher clock rates and better CPU performance has driven power and energy consumption higher. Additionally, the increasing gap between the battery life and the energy consumption requirement for EMAs has imposed a great challenge. Power efficiency can be enhanced by leveraging the SIMD architecture of an embedded processor effectively. Second, there exist multiple audio/video compression formats. The trend of embedded processors is to support a wide range of audio/video formats. The design of multi-format codec demands a careful consideration of the problem of software/hardware co-design. Third, due to the rising complexity of EMAs, most compilers are not able to exploit the architectural features of embedded processors to generate efficient SIMD instructions on the fly. The generated codes are often huge in the size and extremely inefficient. It often demands human's effort to fine-tune C codes or even to optimize assembly codes. This process is time-consuming and not suitable for the tight time-to-market requirement imposed on these systems. More efficient compiling techniques are needed. Some recent R&D efforts to address these problems will be presented in this talk.

Bio - Dr. C.-C. Jay Kuo received the Ph.D. degrees from the Massachusetts Institute of Technology in 1987. He is now with the University of Southern California (USC) as Professor of EE, CS and Mathematics. His research interests are in the areas of digital media processing, multimedia compression, communication and networking technologies, and embedded multimedia system design. Dr. Kuo is a Fellow of IEEE and SPIE. He received the National Science Foundation Young Investigator Award (NYI) and Presidential Faculty Fellow (PFF) Award in 1992 and 1993, respectively. Dr. Kuo has guided 64 students to their Ph.D. degrees and supervised 15 postdoctoral research fellows. Currently, his research group at USC consists around 40 Ph.D. students and 5 postdoctors (please visit website http://viola.usc.edu), which is one of the largest academic research groups in multimedia technologies. He is a co-author of more than 700 technical publications in international conferences and journals as well as seven books. Dr. Kuo is Editor-in-Chief for the *Journal of Visual Communication and Image Representation*, and Editor for *the Journal of Information Science and Engineering* and *the RURASIP Journal of Applied Signal Processing*. He is also on the Editorial Board of the *IEEE Signal Processing Magazine*. He served as Associate Editor for *IEEE Transactions on Image Processing* in 1995-98, *IEEE Transactions on Circuits and Systems for Video Technology* in 1995-1997 and *IEEE Transactions on Speech and Audio Processing* in 2001-2003.

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