



CERIES

Tohoku University Electro-Related Departments
Global COE Program

Center of Education and Research for Information Electronics Systems

Global COE Program Seminar:
Research Activity at Southern Methodist University (SMU)

- (1) Robust Super-Resolution
- (2) Neural Spike Sorting

Date: 14:00 ~ 16:00, July 09, 2010

Place: Room 204, Research Building No.2, Electrical, Information, and Physics
Engineering, Tohoku University

Lecturer: Dr. Panos Papamichalis, Professor at **SMU, Dallas**

Abstract: In image super-resolution, a sequence of images having small relative shifts to each other is collected. Then, the resolution of a reference image is increased by removing aliasing, through the use of the shifted images. However, if some of the collected images have distortion other than the assumed model (e.g., rotation or zooming), the enhanced image will contain artifacts because of these outliers. The first part of the presentation discusses methods to improve the performance of super-resolution in the presence of such outliers.

The second part of the presentation addresses a signal processing problem in the field of neural engineering. Neural scientists collect information on the firings (spikes) of neurons in the brain, and then try to determine which spikes came from which neurons. The process is called Spike Sorting. The spikes, represented by multidimensional vectors, are first reduced in dimensionality for easy visualization, and then are grouped together using clustering techniques. This part of the presentation first discusses a new method of dimensionality reduction which leads to a better separation of the neural clusters. Then, it addresses a new, efficient technique of constructing the clusters that correspond to different neurons.

Biography: Panos Papamichalis has been a Professor of the Electrical Engineering Department at SMU since August 2003. Before that, he spent 23 year with Texas Instruments (TI), between 1980 and 2003, where he became a TI Fellow.

While at TI, Dr. Papamichalis served as the Director of Texas Instruments' Imaging & Audio Lab within the DSPR&D Center in Dallas, and as the Director of TI's Tsukuba R&D Center, in Tsukuba, Japan. From 1984 to 1990, he was a Senior Member of Technical Staff at the Texas Instruments DSP Applications group in Houston, Texas. He was responsible for developing applications of DSP algorithms on programmable DSP processors. He has also served as an adjunct professor at the University of Texas at Dallas, and at Rice University in Houston.

Dr. Papamichalis is an IEEE Fellow. He served as the 2000-2001 President of the IEEE Signal Processing Society. He was the General Chairman of the 1987 International Conference on Acoustics, Speech, and Signal Processing in Dallas, and was selected as a distinguished lecturer of the IEEE ASSP Society of 1989. Between 1990-96 he served as Vice President-Conferences of the IEEE Signal Processing Society. In 1996, he received Signal Processing Society's Meritorious Service Award, and in 2000 he received the IEEE Third Millennium Medal. He is the author of the book "Practical Approaches to Speech Coding", (Prentice-Hall, 1987) and the editor of volumes 2 and 3 of "Digital Signal Processing Applications with the TMS320 Family" (Prentice-Hall, 1990).

Dr. Papamichalis holds four patents in the area of speech coding, and has published many papers on speech processing and digital signal processing. He is a member of Sigma Xi, HKN, and the Technical Chamber of Greece.