



EE 500 GRADUATE COLLOQUIUM

Spring 2014

You are cordially invited to

**“Advances in Adaptive Signal Processing based
on Bio-Inspired Optimization Strategies”**

By

Dr. W. Kenneth Jenkins

Department of Electrical Engineering

Pennsylvania State University

Date: January 23, 2014

Time: 4:00 pm

Location: 160 Willard Bldg

Abstract

While the theory and design of linear adaptive filters based on FIR filter structures is well developed and widely applied in practice, the same situation is not true for linear IIR or nonlinear adaptive filters in general. The latter situation exists because both linear IIR structures and nonlinear structures sometimes produce multi-modal error surfaces on which stochastic gradient optimization strategies fail to reach the global minimum solution. This seminar begins with a concise review of state-of-the-art techniques in linear adaptive filtering, and then addresses the need for nonlinear adaptive DSP in applications such as nonlinear echo cancellation, nonlinear channel equalization, and acoustic channel identification. Several nonlinear adaptive technologies will be reviewed, including Volterra models, neural networks, and IIR cascade modular structures. Then three bio-inspired optimization algorithms will be introduced, including the Genetic Algorithm (GA), the particle swarm optimization (PSO) algorithm, and the Cat Swarm Optimization (CSO) algorithm. Particular emphasis will be placed on comparing the PSO and CSO algorithms because they have not received much previous attention for adaptive filtering.

Biography

W. Kenneth Jenkins received the B.S.E.E. degree from Lehigh University and the M.S.E.E. and Ph.D. degrees from Purdue University. From 1974 to 1977 he was a Research Scientist Associate in the Communication Sciences Laboratory at the Lockheed Research Laboratory, Palo Alto, CA. In 1977 he joined the University of Illinois at Urbana-Champaign where he was a faculty member in Electrical and Computer Engineering from 1977 until 1999. From 1986-1999 Dr. Jenkins was the Director of the Coordinated Science Laboratory. From 1999 through 2011 he served Professor and Head of Electrical Engineering at Penn State University.

Dr. Jenkins' current research interests include fault tolerant DSP for highly scaled VLSI systems, adaptive signal processing, multidimensional array processing, computer imaging, bio-inspired optimization algorithms for intelligent signal processing, and fault tolerant digital signal processing. He co-authored the book *Advanced Concepts in Adaptive Signal Processing*, published by Kluwer in 1996. He is a past Associate Editor for the *IEEE*

Transaction on Circuits and Systems, and a past President (1985) of the CAS Society. He served as General Chairman of the 1988 Midwest Symposium on Circuits and Systems and as the General Chairman of the Thirty Second Annual Asilomar Conference on Signals and Systems. From 2002 to 2007 he served on the Board of Directors of the Electrical and Computer Engineering Department Heads Association (ECEDHA) and as President of ECEDHA in 2005.

Dr. Jenkins is a Life Fellow of the IEEE and a recipient of the 1990 Distinguished Service Award of the IEEE Circuits and Systems Society. In 2000 he received a Golden Jubilee Medal from the IEEE Circuits and Systems Society and a 2000 Millennium Award from the IEEE. In 2000 was named a co-winner of the 2000 International Award of the George Montefiore Foundation (Belgium) for outstanding career contributions to the field of electrical engineering and electrical science, in 2002 he was awarded the Shaler Area High School Distinguished Alumnus Award, and in 2007 he was honored with an IEEE Midwest Symposium on Circuits and Systems 50th Anniversary Award.