The mission of doctoral program in Computing and Information Sciences and Engineering (CISE) at the University of Puerto Rico is to prepare leaders of computing innovation for highly qualified careers in academia, government, and industry. The goal of @CISE Newsletter is to share with the community the achievements of the most important asset of the program: Our students and Faculty.

**Dissertation Defenses**

**Roman Kvasov’s Dissertation Defense**
On April 17, 2013, Roman Kvasov defended his doctoral dissertation titled “Mathematical Modeling and Finite Element Computation of Cosserat Elastic Plates” under the supervision of Dr. Lev Stenberg from the Mathematical Sciences Department at UPRM.

In his doctoral dissertation Roman presented a new mathematical model for bending of Cosserat elastic plates, which assumes approximations over the plate thickness for stress, couple stress, displacement, and micro-rotation. To solve the model, he developed an efficient numerical algorithm for the calculation of the optimal value of the splitting parameter and the computation of the corresponding unique solution of the weak problem. The numerical validation of the proposed method showed that it converges to the analytical solution with optimal linear rate of convergence.

**Juan Valera’s Dissertation Defense**
On May 3, 2013, Juan Valera defended his doctoral dissertation titled “An Information Based Complexity Approach to Acoustic Linear Stochastic Time-Variant Systems” under the supervision of Dr. Domingo Rodriguez from the Electrical and Computer Engineering Department at UPRM.

Juan Valera’s dissertation describes the formulation of a Computational Signal Processing (CSP) modeling framework for the analysis of underwater acoustic signals used in the search, detection, estimation, and tracking (SEDT) operations of moving objects. The underwater acoustic medium where the signals propagate is treated as linear stochastic time-varying system exhibiting double dispersive characteristics, in time and frequency, simultaneously. Acoustic Linear Stochastic (ALS) time-variant systems are characterized utilizing what is known as time-frequency calculus. The interaction of wave front acoustic pressure fields with underwater moving objects is modeled using what is termed Imaging Sonar and Scattering (ISS) operators (Figure 1). It is demonstrated how the proposed CSP modeling framework, called ALSISS, may be formulated as an aggregate of ALS systems and ISS operators. Furthermore, it is demonstrated how concepts, tools, methods, and rules from the field of Information-Based Complexity (IBC) are utilized to seek approximate solutions to NP-hard problems encountered in the analysis of underwater acoustic signals treated under the ALSISS modeling framework.

Figure 1: Two nearby scatters using optimized chirp pulses (From Juan Valera’s dissertation)
Alumni News

Julio Duarte (CISE PhD 2008) is a Research Associate at the Center for Magnetic Resonance Research, Department of Radiology of the University of Minnesota. Currently, he is working on image registration, compressive sensing, and brain connectivity analysis. Before that he worked as a Color Scientist at the Eastman Kodak Co. doing research and software development for color printer units.

One of the significant contributions from Julio’s research work is a two-step adaptive sensing paradigm, where online sensing is applied to detect the signal class in the first step, followed by a reconstruction step adapted to the detected class and the observed samples. This approach is based on information theory, tailored for Gaussian mixture models.

Recent CISE Lectures

- Nov 15, 2012: The scholarship of Research; Dr. Hector Carlo (UPRM)
- Feb 28, 2013: Modeling of Reconfigurable Materials Based on Catalytically-Driven Colloidal Particles; Dr. Ubaldo Cordoba (UPRM)
- April 25, 2013: Analyzing biological samples and subcellular structures with noninvasive optical imaging systems; Dr. Heidy Sierra (Memorial Sloan-Kettering Cancer Center New York, NY)

Students’ News

Humberto Diaz and Isnardo Arenas won first place in the 13th programming competitions held at UPR-Bayamon. (http://www.uprb.edu/profesor/ntorres/competencias.htm)

Walter Quispe participated in the Sampling Advanced Mathematics for Minority Students (SAMMS) summer program organized by The Ohio State University and UPRM. During this summer program Walter was TA of the track on Differential Equations with applications to Population Dynamics (http://www.samms.osu.edu)

Recent Publications

Journals


Peer Reviewed Conferences


