@CISE NEWSLETTER

Issue 1; August 2013

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.

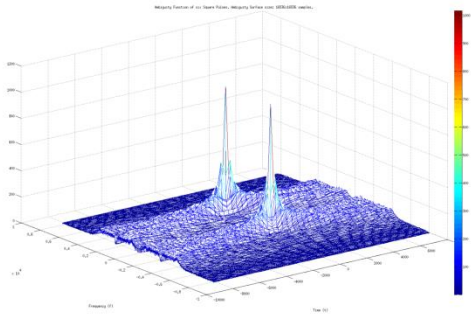

Figure 1: Two nearby scatters using optimized chirp pulses (From Juan Valera's dissertation)

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.

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

M.A. Goenaga, M.C. Torres-Maldronero, M. Velez-Reyes, S.J. Van Bloem, and J.D. Chinea, "Multi-temporal unmixing analysis of Hyperion images over the Guanica dry forest." In **IEEE Journal on Selected Topics in Applied Earth Observations and Remote Sensing**, Vol. 6, No. 2 Part 1, 2013.

L..P. Dorado, M. Velez-Reyes, A. Mukerjee, and B. Roysam, "Vector SIFT Detector for Interest Point Detection in Hyperspectral Imagery."**IEEE Transactions on Geosciences and Remote Sensing**, Vol. 50, No. 11, pp. 4521-4533, 2012.

B. Trigueros-Espinosa, M. Vélez-Reyes, N.G. Santiago and S. Rosario-Torres, "Evaluation of the graphics processing unit architecture for the implementation of target detection algorithms for hyperspectral imagery", **Journal of Applied Remote Sensing** 6, 061506 (Jun 21, 2012).

JE Ramirez-Vick, "Biophysical Stimulation for Bone Regeneration," **JSM Biotech Biomed Eng**, Accepted (2013).

L Polo-Corrales, M Latorre-Esteves, JE Ramirez-Vick, "Scaffold design for bone regeneration**," J Nanosci Nanotech**, Accepted (2013).

X Narváez-Pita, C Ortega-Zuniga, CY Acevedo-Morantes, B Pastrana, J Olivero-Verbel, JE Ramírez-Vick, E Meléndez, "Water soluble molybdenocene complexes: Synthesis, cytotoxic activity and binding studies to ubiquitin by fluorescence spectroscopy, circular dichroism and molecular modeling "**J Biol. Inorg Chem**, Accepted (2013).

CY Acevedo-Morantes, MT Acevedo-Morantes, D Suleiman-Rosado, JE Ramírez-Vick, "Evaluation of the Cytotoxic Effect of Camptothecin Solid Lipid Nanoparticles on MCF7 cells," **Drug Delivery**, Accepted (2013).

M Alvarado-Velez, DM Rivera-Chacon, CY Acevedo-Morantes, SP Singh, E Gultepe, D Nagesha, S Sridhar, JE Ramirez-Vick, "Effect of fibronectin and vitronectin on human fetal osteoblast cell attachment, and proliferationon nanostructured titanium surfaces," **J Biomed Nanotechnol**, 9(6)1-6 (2013).

CY Acevedo-Morantes, E Meléndez, SP Singh, JE Ramírez-Vick, "Cytotoxic effect of Ferrocene and Ferrocenium Ions on MCF7 Breast Cancer Cells**," J Cancer Sci Ther**, 4(9):271-275 (2012).

SK Arya, S Saha, JE Ramirez-Vick, V Gupta, S Bhansalia, SP Singh, "Recent Advances in ZnO Nanostructures and Thin Films for BiosensorApplications," **Analytica Chimica Acta**, 737:1-21 (2012).

P Joshi, S Chakraborti, P Chakrabarti, ZA Ansari, JE Ramirez-Vick, SP Singh, and V Shanker, "Anti-Tumor Chloroquine-Gold Nanocomposites andtheir Binding Interaction with Bovine Serum Albumin: Biophysical and Biochemical Aspects of Protein Binding," **Colloids and Surfaces B: Biointerfaces**, 95:195-200 (2012).

JE Ramirez-Vick, "Nanostructured ZnO for Electrochemical Biosensors" **Biosens Bioelectron**, 3(2):e109 (2012).

CY Acevedo-Morantes, PG Caceres-Valencia, RA Irizarry-Ortiz, SP Singh, JE Ramirez-Vick, "Combinatorial Metal Oxide Nanoscaffolds and its Influence in Osteoblast Cell Adhesion**," J Applied Physics**, 111(10):102810-102817 (2012).

Peer Reviewed Conferences

M.C. Torres-Maldronero and M. Velez-Reyes, "Unsupervised unmixing of hyperspectral imagery using a multiscale representation." To appear in **Proceedings of the 5th IEEE Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing (WHISPERS)**, June 2013.

M. Marin-McGee, S. Velasco-Forero, and M. Velez-Reyes, "Multivariate diffusion and induced segmentation." To appear in**Proceedings of the 5th IEEE Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing (WHISPERS)**, June 2013.

M. Marin-McGee and M. Velez-Reyes, "Enhancement of hyperspectral imagery using spectrally weighted tensor anisotropic nonlinear diffusion for classification." In **Proceedings of SPIE: Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XIX**, Vol. 8743, April 2013.

M.A. Goenaga-Jimenez and M. Velez-Reyes, "Comparing Quadtree Region Partitioning Metrics for Hyperspectral Unmixing." In**Proceedings of SPIE: Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XIX**, Vol. 8743, April 2013.