ECE Seminar

Multi-fidelity Optimization with Ordinal Transformation and Optimal Sampling

Speaker: Prof. Chun-Hung Chen
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Time and Location: Wed. Apr. 30, 2014 at 11am, Engr. E206

ABSTRACT
Simulation/evaluation models of different levels of fidelity are often available for evaluating design alternatives of a complex system. High-fidelity models can accurately predict the performance of a design alternative but are time-consuming to run. Low-fidelity models are much faster but usually lead to bias and variability. Multi-fidelity optimization provides a means to achieve high-fidelity design optimization at reduced computational cost by using a high-fidelity model in combination with lower-fidelity models. However, most existing methods are limited to problems with relatively smooth response with low-dimensional design space. We propose an innovative way of utilizing the lower-fidelity model, called “ordinal transformation”. The new method can reduce a multi-dimensional and even categorical design space into one-dimensional space which is smoother and has nice properties. Utilizing the idea of Optimal Computing Budget Allocation (OCBA) invented by the speaker, we further develop a novel sampling scheme that can optimally determine which designs in the new space to evaluate using the expensive but accurate high-fidelity model. The goal is to maximize the overall optimization efficiency.

BIOGRAPHICAL SKETCH
Chun-Hung Chen received his Ph.D. degree in Engineering Sciences from Harvard University in 1994. He is currently a Professor at George Mason University. He is also affiliated with National Taiwan University. Dr. Chen was an Assistant Professor of Systems Engineering at the University of Pennsylvania before joining GMU. Sponsored by NSF, NIH, DOE, NASA, MDA, Air Force, and FAA, he has worked on the development of very efficient methodology for stochastic simulation optimization and its applications. Dr. Chen received a “National Thousand Talents Award” in 2011, the Best Automation Paper Award from the 2003 IEEE International Conference on Robotics and Automation, 1994 Eliahu I. Jury Award from Harvard University, and the 1992 MasPar Parallel Computer Challenge Award. He has served as a department editor for IIE Transactions, associate editor of IEEE Transactions on Automatic Control, associate editor of IEEE Transactions on Automation Science and Engineering, area editor of Journal of Simulation Modeling Practice and Theory, and associate editor of International Journal of Simulation and Process Modeling. Dr. Chen is the author of two books, including “Stochastic Simulation Optimization: An Optimal Computing Budget Allocation”.