

**MECHANICAL ENGINEERING DEPARTMENT
ME/ISyE 8773-8774**

Optimal Spectrum Management: Complexity, Duality and Approximation*

by

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Wednesday, December 5, 2007
3:15 p.m. — Refreshments before the seminar
3:30 p.m. — Graduate Seminar
Room 1130 ME

ABSTRACT — We consider a class of nonconvex optimization problems arising from spectrum management in multiuser communication. For the discretized version of this problem, we characterize its computational complexity under various practical settings and study the structure of its global optimal solutions. It is shown that this discretized nonconvex optimization problem is NP-hard in general and has a positive duality gap. Surprisingly this duality gap disappears asymptotically as the size of discretization step decreases to zero, thanks to a hidden convexity that can be uncovered by the Lyapunov Theorem in functional analysis. Based on this asymptotic zero duality result and a Lagrangian dual relaxation, we present, for any positive ϵ , a polynomial time approximation scheme to compute an ϵ -optimal solution for the continuous version of the resource management problem.

**joint work with Shuzhong Zhang, Chinese University of Hong Kong*

BIO — **Zhi-Quan (Tom) Luo** is a professor in the Department of Electrical and Computer Engineering at the University of Minnesota (Twin Cities) where he holds an endowed ADC Chair in digital technology. He received his B.Sc. degree in Applied Mathematics in 1984 from Peking University, China, and a Ph.D. degree in Operations Research from MIT in 1989. From 1989 to 2003, Dr. Luo was with the Department of Electrical and Computer Engineering, McMaster University, Canada, where he eventually served as the department head and held a Canada Research Chair in Information Processing. His research interests lie in the union of optimization algorithms, data communication and signal processing.

Dr. Luo is a fellow of IEEE. He serves on the IEEE Signal Processing Society Technical Committees on Signal Processing Theory and Methods (SPTM), and on the Signal Processing for Communications (SPCOM). He is a co-recipient of the 2004 IEEE Signal Processing Society's Best Paper Award, and has held editorial positions for several international journals including Journal of Optimization Theory and Applications, Mathematics of Computation, and IEEE Transactions on Signal Processing. He currently serves on the editorial boards for SIAM Journal on Optimization, Mathematical Programming, and Mathematics of Operations Research.

Informal Faculty Luncheon: Wednesday, December 5, 2007, 12:00 noon. Meet in 1100 ME and walk to lunch with other faculty. Prof. Zhi-Quan (Tom) Luo will be able to attend. Faculty Host is Prof. Bharath Rangarajan.