

## Signal Processing Seminar

**Title:** Generic Invertibility of Multidimensional FIR Filter Banks and MIMO Systems

**Speaker:** Ka Lung Law

**Date:** Wednesday, November 5, 2008

**Time:** 4:00 - 5:00 pm

**Where:** 4269 Beckman Institute

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**Abstract:** We study the invertibility of  $M$ -variate polynomial (respectively : Laurent polynomial) matrices of size  $N$  by  $P$ . Such matrices represent multidimensional systems in various settings including filter banks, multiple-input multiple-output systems, and multirate systems. Given an  $N \times P$  polynomial matrix  $H(z_1, \dots, z_M)$  of degree at most  $k$ , we want to find a  $P \times N$  polynomial (resp. : Laurent polynomial) left inverse matrix  $G(z)$  of  $H(z)$  such that  $G(z)H(z) = I$ . We provide computable conditions to test the invertibility and propose algorithms to find a particular inverse. Once a particular inverse is found, we can characterize all inverses and find an optimal inverse according to a design criterion. The main result of this paper is to prove that when  $N - P \geq M$ , then  $H(z)$  is generically invertible; whereas when  $N - P < M$ , then  $H(z)$  is generically noninvertible. As a result, we propose a faster algorithm to find a particular inverse of a Laurent polynomial matrix.

--- This is joint work with Robert Fossum and Minh Do ---