

Algebra and Number Theory Seminar

Title: Switched systems, common solution to the Lyapunov equation and semidefinite programming
Speaker: Helena Smigoc (UCD)
Date: Mon 8th October 2007 at 4:00PM
Location: Mathematical Sciences Seminar Room

Abstract: matrix A is called (Hurwitz) stable if all its eigenvalues lie in the open left half of the complex plane. If A is a stable matrix, then the linear time-invariant system for A is stable. A classical result of Lyapunov states that a matrix A is stable if and only if for arbitrary Hermitian positive definite Q, the Lyapunov equation $AP+PA^* = -Qadmitsapositive definite solution P$.

By a switched system we mean a dynamical system consisting of a family of linear time-invariant systems and a rule that orchestrates the switching between them. To guarantee a stability of such switched systems under arbitrary switching signals, it is sufficient to show that there exists a common solution to the Lyapunov equations associated with all the linear time-invariant systems defining the switched system.

Determining the existence of a common solution to the Lyapunov equation for a finite set of linear time-invariant systems is very difficult. In this talk we will discuss some special cases for which nice easily checkable conditions can be found. In particular, we will present a solution for 2x2 matrices and for matrices whose difference has rank

one. We will show how methods from semidefinite programming can be applied to this problem.