Federico Poloni

"The benefits of changing identity (in Lagrangian subspaces and doubling algorithms)"

Abstract:

We prove that every Lagrangian subspace is spanned by some row permutation of $[I; X]$, where I is the nxn identity matrix and X is symmetric/Hermitian (up to some sign changes) with all its entries bounded in modulus by $\sqrt{2}$. With respect to the usual representation as span of $[I; X]$, allowing the row permutation lets us obtain the entrywise bound on X, which ensures that the basis is computationally tame.

Small modifications of this result can be adapted to provide representations of symplectic and Hamiltonian pencils, and can be used to implement a pencil arithmetic primitive that is used in the context of doubling algorithms for algebraic Riccati equations. In particular, we obtain for the first time a doubling variant that has the potential to be *structure-preserving* and *computationally stable* at the same time. This is joint work with Volker Mehrmann.