Block Arnoldi-based methods for large scale discrete-time algebraic Riccati equations

K. Jbilou
L.M.P.A.
Université du Littoral Côte d'Opale
50 rue F. Buisson BP699, F-62228 Calais Cedex, France
jbilou@lmpa.univ-littoral.fr

Algebraic Riccati equations (discrete-time or continuous-time) play a fundamental role in many problems in control theory. They arise in linear-quadratic regulator problems, H_∞ or H_2-control, model reduction problems and many others. In this talk we propose numerical methods for large discrete-time algebraic Riccati equations (DARE).

We present block projection methods that allow us to compute low rank approximations to the d-stabilizing solution. We project the initial problem onto a block or onto an extended block Krylov subspace, generated by the pair (A, C) and we obtain a low dimensional DARE that is solved by a standard algorithm such as the Schur method. We present the two methods and give new theoretical results such as upper bounds for the norm of the error. We will also present the Newton method associated with the block Arnoldi algorithm used for solving, at each Newton's iteration, the obtained Stein matrix equation.