A NEW MATHEMATCA SOFTWARE PACKAGE FOR CONTROL SYSTEMS Control Systems Professional - ADVANCED NUMERICAL METHODS

"Advanced Numerical Methods" is a new MATHEMATICA application package that I and my former student Dr. Daniil Sarkissian, developed in collaboration with Wolfram Research. The package is a part of Control System Professional Suite, which provides an object-oriented environment with symbolic, numeric, and arbitrary precision tools for modeling, analysis, design, and simulation of control systems.

"Advanced Numerical Methods" adds an extensive collection of numerical algorithms for each problem. Users can select the most appropriate tool for a given task or have the package choose a suitable method automatically based on the size of data and the required accuracy.

The implemented algorithms include:

- The Schur and Hessenberg-Schur methods for the Lyapunov and Sylvester matrix equations
- The Schur, Newton, matrix-sign function, and inverse-free methods for solving the algebraic Riccati equations
- The block-Hessenberg forms and Cholesky factors of the controllability and observability Gramians
- The recursive, explicit QR, Schur, and other algorithms for pole assignment, as well as the projection technique for the partial pole assignment
- Constrained feedback stabilization using the pole assignment and Lyapunov algorithms
- The design of the reduced-order state estimator and model reduction via an extensive library of algorithms
- System identification using the Markov parameters, the subspace identification method, and the frequency-domain methods
- Algorithms for the generalized matrix eigenvalue problem, the generalized Schur decomposition, and the ordered Schur and generalized Schur decompositions

The package is integrated with the Mathematica Help Browser and includes a 137-page manual. Examples are provided for applications in the aeronautic, chemical, mechanical and electrical engineering disciplines, and other fields. The entire documentation is also available online at http://documents.wolfram.com/applications/anm/ and is free for classroom use by students and researchers.

More details about the package and Control System Professional Suite are available at http://www.wolfram.com/products/applications/anm/ and
http://www.wolfram.com/products/applications/csps/