**Advanced Numerical Methods** extends the scope of Control System Professional with an extensive collection of state-of-the-art numerical algorithms for the analysis and design of linear control systems. It seamlessly integrates into the Control System Professional framework using the same data structures and some of the same function names. You can choose the most appropriate algorithm for a given task or have the package choose a suitable method automatically based on the size of the problem, the precision of the data, and the accuracy required. Combined with Mathematica’s extensive graphical capabilities and automatic arbitrary-precision control, Advanced Numerical Methods provides a superior environment for solving industrial and research control problems.

**KEY BENEFITS**

- Seamlessly integrates into the Control System Professional framework and takes advantage of the extensive graphical capabilities and automatic arbitrary-precision control in Mathematica.
- Implements reliable and robust numerical algorithms, including several new methods for Lyapunov, Sylvester, and Riccati equations, to solve a wide class of control problems and linear algebra problems with applications in control theory.
- Automatically selects suitable algorithms based on the application, but lets advanced users choose from several computationally viable numerical algorithms to solve each problem.
- Includes a brief theoretical description of the algorithms and methods used in the package.

For more information, visit [www.wolfram.com/anm](http://www.wolfram.com/anm).
**Advanced Numerical Methods** adds numerous state-of-the-art algorithms to the familiar *Control System Professional* and Mathematica framework.

**Advanced Numerical Methods Features**

- **Solutions of the Lyapunov and Sylvester Matrix Equations**
  - Schur methods for solving the Lyapunov equations - Hessenberg-Schur methods for solving the Sylvester equations - Direct computation of the Cholesky factors of the controllability and observability Gramians

- **Solutions of the Algebraic Riccati Equations**
  - Schur, Newton's, and matrix-sign methods for solving the discrete and continuous matrix algebraic Riccati equations - Inverse-free methods based on the generalized eigenvector and the generalized Schur decompositions

- **Reduction to Controller-Hessenberg and Observer-Hessenberg Forms**
  - Computation of the block controller-Hessenberg and observer-Hessenberg forms

- **Controllability and Observability Tests**
  - Controllability and observability tests using the controller-Hessenberg and observer-Hessenberg forms - Controllability and observability tests using the Cholesky factors of the controllability and observability Gramians

- **Pole Assignment**
  - Recursive, explicit QR, and Schur methods for multi-input systems - RQ modification of the recursive method and the implicit RQ method for single-input systems - Projection technique for the partial pole assignment problem

**General Mathematica Features**

- Over 1900 built-in functions, including the world’s largest collection of advanced algorithms for numeric and symbolic computation, discrete mathematics, statistics, data analysis, graphics, visualization, and general programming

- Multi-paradigm symbolic programming language with support for procedural, functional, list-based, object-oriented, and symbolic programming constructs

- Automatic precision control and support for exact integers of arbitrary length, rationals, floating-point real and complex numbers, and arbitrary-precision real and complex numbers

- User-defined or automatic algorithm selection for optimal performance

- Fully programmable 2D and 3D visualization with over 50 built-in plot types

- High-speed numerical linear algebra with performance equal to specialized numeric libraries

**Technical Requirements**

Advanced Numerical Methods requires Mathematica 4.2 or later and *Control System Professional* 2 or later. Advanced Numerical Methods is available for Windows, Mac OS X, Linux, and Unix. For a more detailed list, see www.wolfram.com/mathematica/platforms.

**Related Products**

The Mathematica Applications Library is a continually expanding collection of software used in conjunction with Mathematica to quickly handle specific tasks in engineering, finance, data analysis, and many other technical areas.

Some of the software packages available are:

- Neural Networks - Signals and Systems - Digital Image Processing - Mechanical Systems - Wavelet Explorer - Time Series - Experimental Data Analyst - Fuzzy Logic

Find the latest products and buy online throughout the world at store.wolfram.com. Choose from over 50 technical software products, more than 200 books, Mathematica posters, T-shirts, and other items.

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