

MATRIXx – System Design and Control Development Software

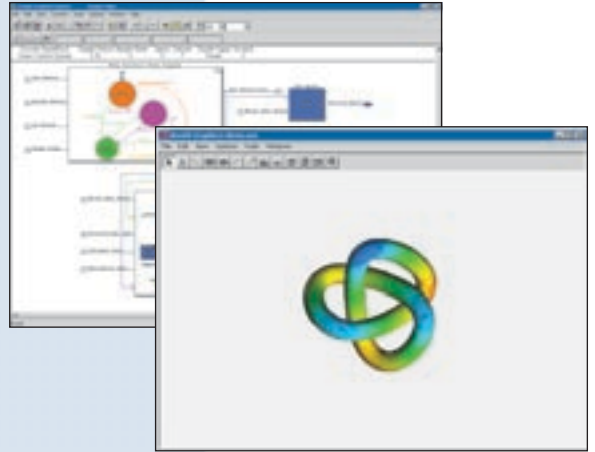
NI MATRIXx

- Mathematical analysis, visualization, and scripting in Xmath
- Visual modeling, simulation, and design through SystemBuild
- Automatic code generation for simulation and real-time embedded targeting with AutoCode
- Automatic documentation generation through DocumentIt
- Add-on modules for system-specific customization
- Seamless integration between package components

Operating Systems

- Windows 2000/NT/XP
- Sun Solaris
- SGI IRIX
- IBM AIX
- Compaq Tru64
- HP-UX

NEW



Overview

Engineers and scientists have relied on the National Instruments MATRIXx product family for nearly 20 years for advanced system design and control development. This comprehensive suite of products provides a seamless software solution. Move from initial system design and analysis to dynamic modeling and simulation, early control algorithm development, rapid prototyping, hardware-in-the-loop testing, to final system analysis. The tight integration between each component in the NI MATRIXx product family makes this an ideal tool for large development teams tackling multiple tasks. A small team can also work in the same environment throughout the development process.

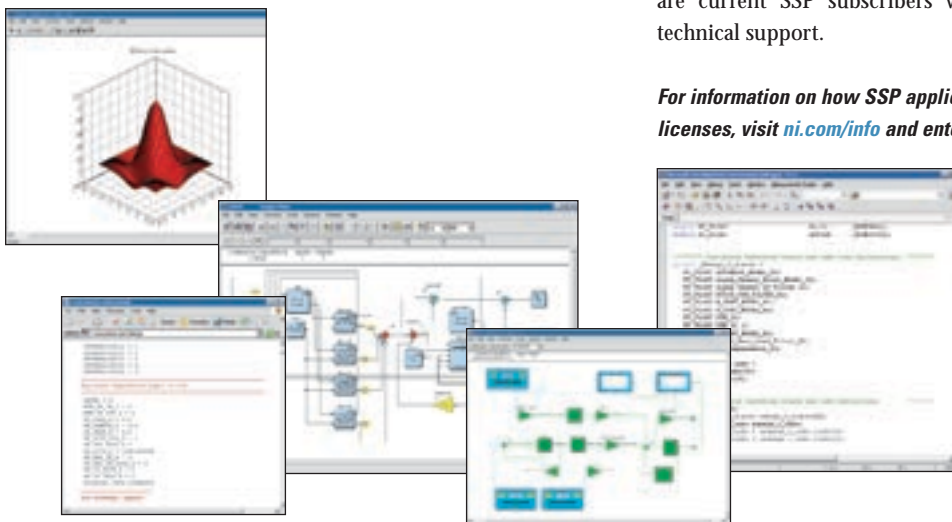
MATRIXx Services and Support

National Instruments services and support for MATRIXx meet your needs through the application life cycle – from planning and development through deployment and ongoing maintenance. Our services and support resources are tailored for customer requirements in research, design, validation, and implementation. Visit ni.com/services for details.

Software Maintenance

The MATRIXx Software Subscription Program (SSP) is designed to give you premium maintenance services, priority technical support, and automatic updates of your software package. Customers who are current SSP subscribers will receive product updates and technical support.

For information on how SSP applies to lapsed or perpetual MATRIXx licenses, visit ni.com/info and enter matrixx



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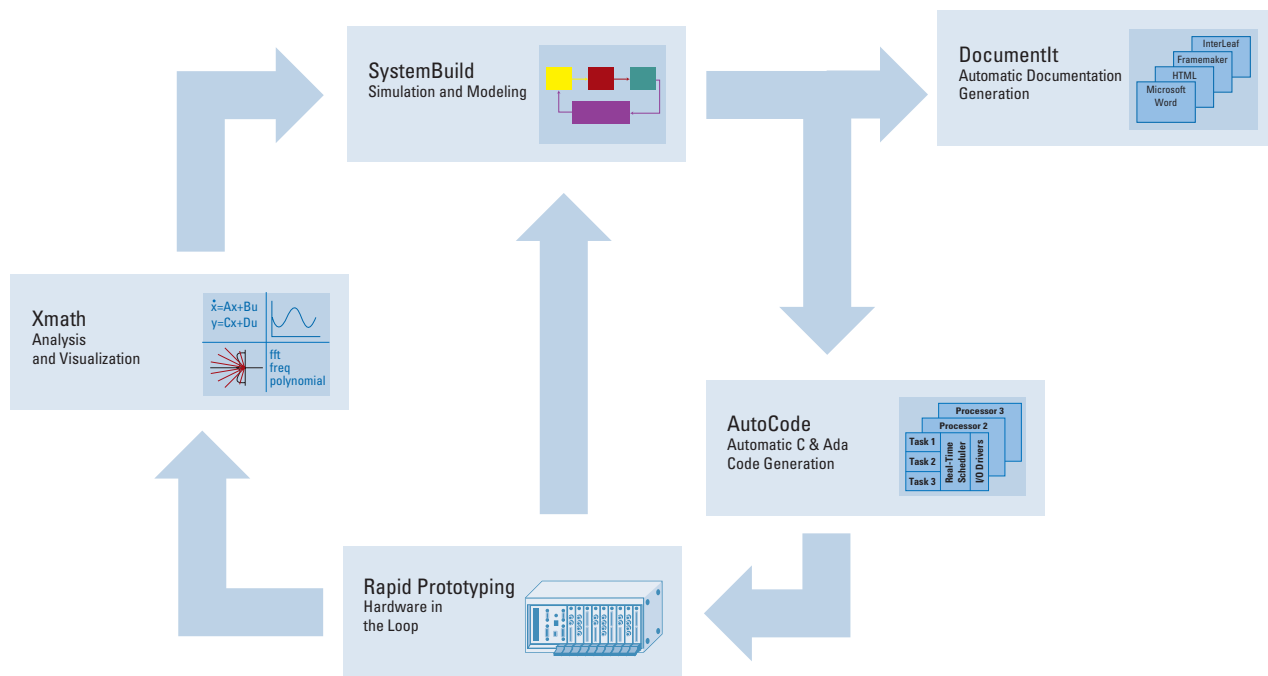


Figure 1. Target your AutoCode - generated code to LabVIEW Real-Time and PXI hardware for your rapid control prototyping and hardware-in-the-loop solutions.

SystemBuild – Simulation and Modeling

The core of the NI MATRIXx products is SystemBuild, an easy-to-use graphical framework for modeling and simulating complex dynamic systems, as well as specifying and testing control and software algorithms. SystemBuild has a hierarchical block-diagram modeling paradigm designed for simple development of complex models based on an extensive library of primitive blocks.

Modeling and simulating dynamic systems becomes an interactive process with SystemBuild. With features such as an intuitive graphical editor with extensive labeling and documentation capabilities, a user can quickly document his/her model through interactive windows and dialogues. SystemBuild also offers a graphical user interface layer that creates interactive simulations incorporating user input, in addition to standard batch simulations. Use data logging capabilities for postprocessing, analysis, and interactive visualization of simulation data. Extend the SystemBuild modeling capabilities through additional advanced analysis and design modules. Model options include fuzzy logic design, neural network design, optimization control, aerospace libraries, configuration management for use with source code control software, state transition diagram editors, and more.

Quickly validate and iterate SystemBuild-generated models through simulation on the development machine. Datalogging capabilities provide quick analysis and visualization of simulation

results in Xmath through seamless integration of the software components. Easily implement real-time deployment of SystemBuild models through AutoCode, the MATRIXx automatic code generation module automatically integrated into the SystemBuild environment. In addition, achieve automatic documentation generation with DocumentIt.

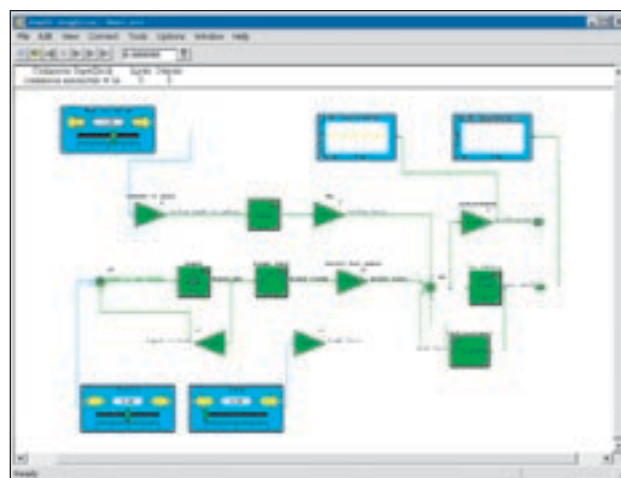


Figure 2. Graphically model your system and perform simulations in SystemBuild.

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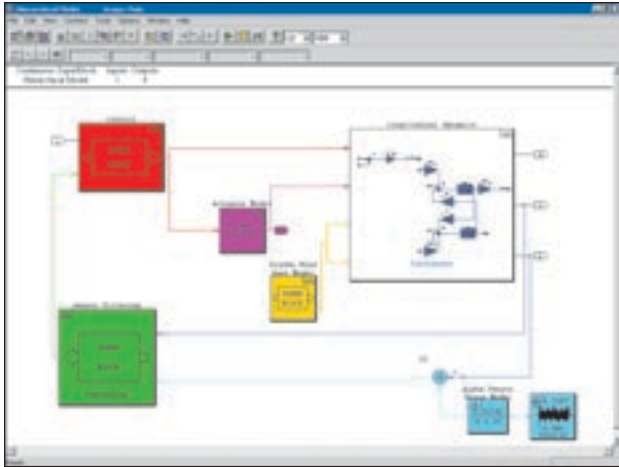


Figure 1. View your data with Xmath's advanced 2D and 3D graphing capabilities.

Xmath – Mathematical Analysis, Visualization, and Scripting

The Xmath software tool provides a stand-alone working environment for numerical analysis with more than 700 predefined functions and commands, including basic mathematics, filter design, and more. Xmath also provides presentation-quality plotting capabilities for 2D and 3D data and a graphical user interface layer for the creation of windows, dialogs, and other interactive user interface components.

In addition, Xmath can be used concurrently with SystemBuild, so you can simultaneously edit SystemBuild models, perform Xmath analysis of SystemBuild simulations, develop control design algorithms, and display results using the Xmath advanced plotting and user interface functions.

At the heart of Xmath is the unique programming language, MathScript. Through MathScript, users can extend Xmath functionality even further by creating new functions, commands, and objects or customizing existing ones. You can also use external C routines through MathScript. With a unique interprocess communication mechanism, you can run an external C routine in a separate process from Xmath, giving you the ability to modify and recompile your C code without exiting Xmath. Correspondingly, with the User-Callable Interface feature of Xmath, an external C process can invoke Xmath as a computational engine, passing values and expressions to evaluate and retrieve results, perform calculations, and plot results.

The object-oriented nature of MathScript makes Xmath unique among numerical analysis tools. With the hierarchical Xmath objects, you not only can simplify the process of checking and updating data

characteristics but also can optimize data representation, manipulation, storage, and management through new object creation and object overloading. Similarly, an interactive developer and additional checking utilities simplify script development.

AutoCode – Automatic Code Generation

The AutoCode automatic code generation utility instantly converts your SystemBuild visual diagram into highly optimized and readable ANSI C or Ada. Transfer this code to an embedded target for rapid control prototyping, hardware-in-the-loop simulation, or even final system deployment. Automatic code generation greatly decreases time spent in the iterative processes of deployment and model verification by eliminating the need to manually update deployment code to reflect model updates. AutoCode uses template-based code generation. With templates, you can standardize the generated code as well as customize it for specific embedded target requirements.

Expand AutoCode capabilities even further through additional toolkits. The AutoCode Fixed-Point Extension implements fixed-point data types for both ANSI C and Ada code generation. While some embedded targets require fixed-point data types, floating-point embedded targets can take advantage of these optimized data types to further decrease code footprint and optimize time-consuming mathematical computation. In addition, the AutoCode Multiprocessor Extension adds further customization options for targeting multiprocessor systems. Map portions of the SystemBuild model to specific processors on the embedded target, designate interrupt handling, process priority, and more to take full advantage of the capabilities of your multiprocessor target.

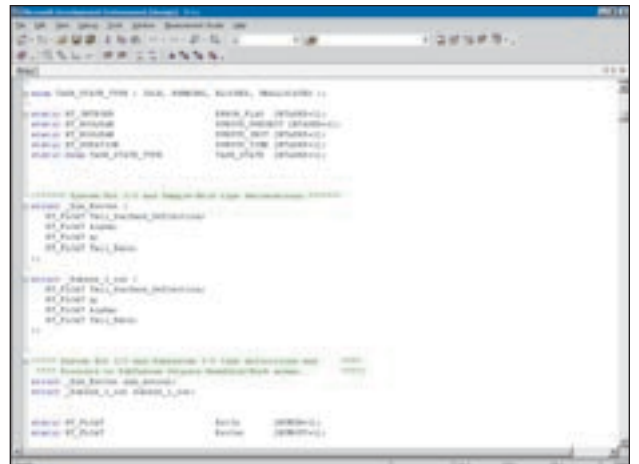


Figure 2. Automatically generate highly optimized C or Ada code configured specifically for your target with AutoCode.

MATRIXx Add-Ons and Ordering Information

Xmath Modules

Control Design Module – A complete set of tools for MIMO (multiple input, multiple output), continuous, and discrete domain control design and analysis

Robust Control Module – A set of tools based on modern robust control design theory, including tools for analyzing, designing, and evaluating the performance of robust control systems

Model Reduction Module – A collection of tools for reducing the order of system models

Xm Module – A library of advanced multivariable robust control routines emphasizing controller design and synthesis

Interactive Control Design Module – A collection of classical and modern control design and analysis tools for SISO (single input, single output) and MIMO systems

Interactive System Identification Module – A set of tools for interactively identifying system models based on measurement data

Optimization Module – Tools based on the Karmarkar algorithm for solving a wide variety of optimization problems

SystemBuild Modules

State Transition Diagrams Module – Adds graphical creation and execution of finite state machines

HyperBuild Module – Accelerates SystemBuild simulations; requires C compiler

RT/Fuzzy Logic Module – Complete development environment for design and simulation of real-time fuzzy logic applications

Neural Networks Module – Interactive tool for the design, modeling, and simulation of artificial neural networks

Interactive Animation Module – For creating, editing, and operating displays for interacting with and monitoring SystemBuild-based models

Configuration Management Module – For directly checking files in and out of a code management tool including Microsoft Visual SourceSafe, PVCS, and ClearCase

Aerospace Libraries Module – Collection of built-in, user-accessible SystemBuild block diagrams including standard aerospace environmental, six-degrees-of-freedom, and attitude geometry models

Altia Design Module – Used by product engineers to quickly design user interfaces, producing interactive software prototypes that can accelerate development cycles

Altia Faceplate Module – Includes numerous libraries of components for quickly creating a user interface to SystemBuild simulations and a state-of-the-art editor for creating custom graphical panels

AutoCode Modules

AutoCode C Fixed-Point Extension – For C code generation with fixed-point data types

AutoCode C Multiprocessor Extension – For C code generation optimized for use on multiprocessor machines

AutoCode Ada Fixed-Point Extension – For Ada code generation with fixed-point data types

AutoCode Ada Multiprocessor Extension – For Ada code generation optimized for use on multiprocessor machines

DocumentIt – Automatic Documentation Generation

DocumentIt provides template-based documentation generation for SystemBuild models. Extract key model parameters, including signal labels, ranges, and data types into an easily readable tabular/textual format. Select additional important parameters to include. Automatically generate customized graphical specifications and include in the model documentation at user-specific locations.

With defined templates, you can achieve consistent, standardized documentation of the design process across multiple engineering groups throughout the enterprise. Automatically extract parameters and specifications and format into any ASCII interchange compatible format, including FrameMaker, Interleaf, Microsoft Word, and HTML.

MATRIXx Professional Services

NI offers MATRIXx Professional Services via companies in our worldwide Alliance Program. These companies offer decades of expertise with MATRIXx and application experience in a wide variety of industries. Their services range from basic start-up assistance and collaborative development with your engineers, to turnkey solutions and maintenance of your system.

Ordering Information

NI MATRIXx Development System860620-01
(SystemBuild, Xmath, AutoCode, DocumentIt, Add-Ons)
NI MATRIXx Software Subscription Program.....860621-01

Training
MATRIXx Basics.....910657-xx
MATRIXx Advanced910658-xx

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