Model Predictive Control Toolbox Release Notes

Contents

Summary by Version

This table provides quick access to what's new in each version. For clarification, see "Using Release Notes".

Version (Release)	New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Latest Version V2.3.1 (R2008a)	No	No	No	Printable Release Notes: PDF Current product documentation
V2.3 (R2007b)	Yes Details	No	No	No
V2.2.4 (R2007a)	No	No	Bug Reports Includes fixes	No
V2.2.3 (R2006b)	No	No	No bug fixes	No
V2.2.2 (R2006a)	Yes Details	No	No bug fixes	No
V2.2.1 (R14SP3)	No	No	No bug fixes	No
V2.2 (R14SP2)	No	No	No bug fixes	No
V2.1 (R14SP1)	No	No	Fixed bugs	No
V2.0 (R14)	Yes Details	No	Known problems	No

Using Release Notes

Use release notes when upgrading to a newer version to learn about:

- New features
- Changes
- Potential impact on your existing files and practices

Review the release notes for other MathWorks™ products required for this product (for example, MATLAB® or Simulink® for enhancements, bugs, and compatibility considerations that also might impact you.

If you are upgrading from a software version other than the most recent one, review the release notes for all interim versions, not just for the version you are installing. For example, when upgrading from V1.0 to V1.2, review the release notes for V1.1 and V1.2.

What's in the Release Notes

New Features and Changes

- New functionality
- Changes to existing functionality

Version Compatibility Considerations

When a new feature or change introduces a reported incompatibility between versions, the **Compatibility Considerations** subsection explains the impact.

Compatibility issues reported after the product is released appear under Bug Reports at the MathWorks Web site. Bug fixes can sometimes result in incompatibilities, so you should also review the fixed bugs in Bug Reports for any compatibility impact.

Fixed Bugs and Known Problems

The MathWorks offers a user-searchable Bug Reports database so you can view Bug Reports. The development team updates this database at release time and as more information becomes available. This includes provisions for any known workarounds or file replacements. Information is available for bugs existing in or fixed in Release 14SP2 or later. Information is not available for all bugs in earlier releases.

Access Bug Reports using your MathWorks Account.

Version 2.3.1 (R2008a) Model Predictive Control Toolbox™ Software

This table summarizes what's new in Version 2.3.1 (R2008a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
No	No	No	Printable Release Notes: PDF Current product documentation

Version 2.3 (R2007b) Model Predictive Control Toolbox™ Software

This table summarizes what's new in Version 2.3 (R2007b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	No	No

New features and changes introduced in this version are:

- "New Option for Specifying Time-Varying Constraints" on page -4
- "Ability to Specify Nondiagonal Q and R Weight Matrices in the Cost Function" on page -4

New Option for Specifying Time-Varying Constraints

You can now configure the Model Predictive Controller block in Simulink® to accept time-varying constraint signals that are generated by other blocks. To add inports to which you can connect time-varying constraint specifications, select the new **Enable input port for input and output limits** check box in the MPC Controller block. See also the mpcvarbounds demo.

In the previous version, you could only specify the constraints during the design phase and these contraints remained constant for the duration of the simulation.

For more information about the new **Enable input port for input and output limits** check box in the Model Predictive Controller block, see the MPC Controller block reference page.

Ability to Specify Nondiagonal Q and R Weight Matrices in the Cost Function

You can now specify off-diagonal weights in the cost function. In the previous release, only diagonal Q and R matrices were supported.

To learn more about specifying off-diagonal weights, see the discussion about weights in the MPC Controller block reference pages.

To access a new demo that shows how to use nondiagonal weight matrices, type the following command at the MATLAB prompt:

```
showdemo('mpcweightsdemo')
```

Version 2.2.4 (R2007a) Model Predictive Control Toolbox™ Software

This table summarizes what's new in Version 2.2.4 (R2007a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
No	No	Bug Reports Includes fixes	No

Version 2.2.3 (R2006b) Model Predictive Control Toolbox™ Software

This table summarizes what's new in Version 2.2.3 (R2006b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
No	No	No bug fixes	No

Version 2.2.2 (R2006a) Model Predictive Control Toolbox™ Software

This table summarizes what's new in Version 2.2.2 (R2006a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	No bug fixes	No

New features and changes introduced in this version are described here.

Bumpless Transfer Added to MPC Block

Bumpless transfer between manual and automatic operation or from one controller to another has been added to the Model Predictive Controller block in Simulink®. This block now allows feedback of the true manipulated variable signals, which allows the controller to maintain an accurate state estimate during periods when its calculated adjustments are not being sent to the plant. For example, the controller's output might be ignored during a startup period or during temporary intervention by a (simulated) plant operator. If the controller assumes that its adjustments are being implemented (the default behavior), its state estimate will be incorrect, leading to a "bump" when the controller is reconnected to the plant. A tutorial example has been added to the documentation.

Bumpless Transfer Demo Added

A new demo illustrating bumpless transfer has been added to the toolbox.

Version 2.2.1 (R14SP3) Model Predictive Control Toolbox™ Software

This table summarizes what's new in Version 2.2.1 (R14SP3):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
No	No	No bug fixes	No

Version 2.2 (R14SP2) Model Predictive Control Toolbox™ Software

This table summarizes what's new in Version 2.2 (R14SP2):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
No	No	No bug fixes	No

Version 2.1 (R14SP1) Model Predictive Control Toolbox™ Software

This table summarizes what's new in Version 2.1 (R14SP1):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
No	No	Fixed bugs	No

Version 2.0 (R14) Model Predictive Control Toolbox™ Software

This table summarizes what's new in Version 2.0 (R14):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	Fixed bugs	No

New features and changes introduced in this version are

- "Object-Oriented Command Syntax Revised" on page -12
- "MPC Block for Simulink® Revised" on page -13
- "MPC Tools Designer Added" on page -13
- "Integration with Other MATLAB® Toolboxes" on page -13
- "Demos" on page -14
- "Documentation" on page -14

Object-Oriented Command Syntax Revised

The command syntax has been completely revised, and is similar to that used in the Control System Toolbox™ software. You create an "LTI object" to represent the plant to be controlled, using it and other specifications to create an MPC object, which represents the controller. You can then analyze controller properties, run simulations, modify the controller design, etc. The following list summarizes the major command features:

- Create and modify an MPC object.
- Extract a linear representation of the unconstrained controller as an LTI object (transfer function, state space, or zero-pole-gain).
- Calculate closed-loop steady-state gains for the unconstrained controller.
- Determine closed-loop steady-state conditions for given inputs and/or outputs.

- Calculate the constrained control action at a specified condition (can be used repeatedly as time evolves in a simulation or experiment).

- Simulate closed-loop constrained response for a linear plant and arbitrary changes in the reference signals (setpoints), disturbances, and noise.

- Specify disturbance characteristics to improve regulation while maintaining good response to reference signal changes (2-DOF design).

MPC Block for Simulink® Revised

The completely revised MPC block lets you insert your MPC controller object into a Simulink® block diagram. You can use multiple MPC blocks within a single Simulink model if you want. In any case, the MPC block makes it easy to evaluate controller performance with a nonlinear plant.

MPC Tools Designer Added

MPC Tools is a new graphical environment that lets you design and test an MPC controller object without learning the command syntax. It is tightly integrated with the MPC block for Simulink, making it easy to run either a linear or nonlinear simulation.

Integration with Other MATLAB® Toolboxes

The Model Predictive Control Toolbox™ uses the same LTI model representation found in the Control System Toolbox™ software, System Identification Toolbox™ software, etc. Examples of ways in which you can exploit toolbox compatibility include the following:

- Import raw dynamic response data to the System Identification Toolbox, software, determine an appropriate LTI plant model, and export it to Model Predictive Control Toolbox software for controller design.

- Extract an LTI representation of a model predictive controller for analysis in the Control System Toolbox or Robust Control Toolbox™.

Integration with Control and Estimation Tools Manager

The Model Predictive Control Graphical Design Tool is integrated with other control and estimation projects within the Control and Estimation Tools Manager environment. In general, this lets you group control-related applications associated with the same Simulink model and share

infrastructure. Specifically, the ability to combine the functionality of Model Predictive Control Toolbox and Simulink Control Design Toolbox softwre allows in-situ model predictive control design in Simulink by linearizing a Simulink model as it is connected to an MPC block, with automatic use of the resulting linear model to define the internal MPC plant model.

Demos

The Model Predictive Control Toolbox software includes new demos that highlight all the added features.

Documentation

The documentation has been revised completely.

Compatibility Summary for Model Predictive Control Toolbox™

This table summarizes new features and changes that might cause incompatibilities when you upgrade from an earlier version, or when you use files on multiple versions. Details are provided with the description of the new feature or change.

Version (Release)	New Features and Changes with Version Compatibility Impact
Latest Version V2.3.1 (R2008a)	None
V2.3 (R2007b)	None
V2.2.4 (R2007a)	None
V2.2.3 (R2006b)	None
V2.2.2 (R2006a)	None
V2.2.1 (R14SP3)	None
V2.2 (R14SP2)	None
V2.1 (R14SP1)	None
V2.0 (R14)	None