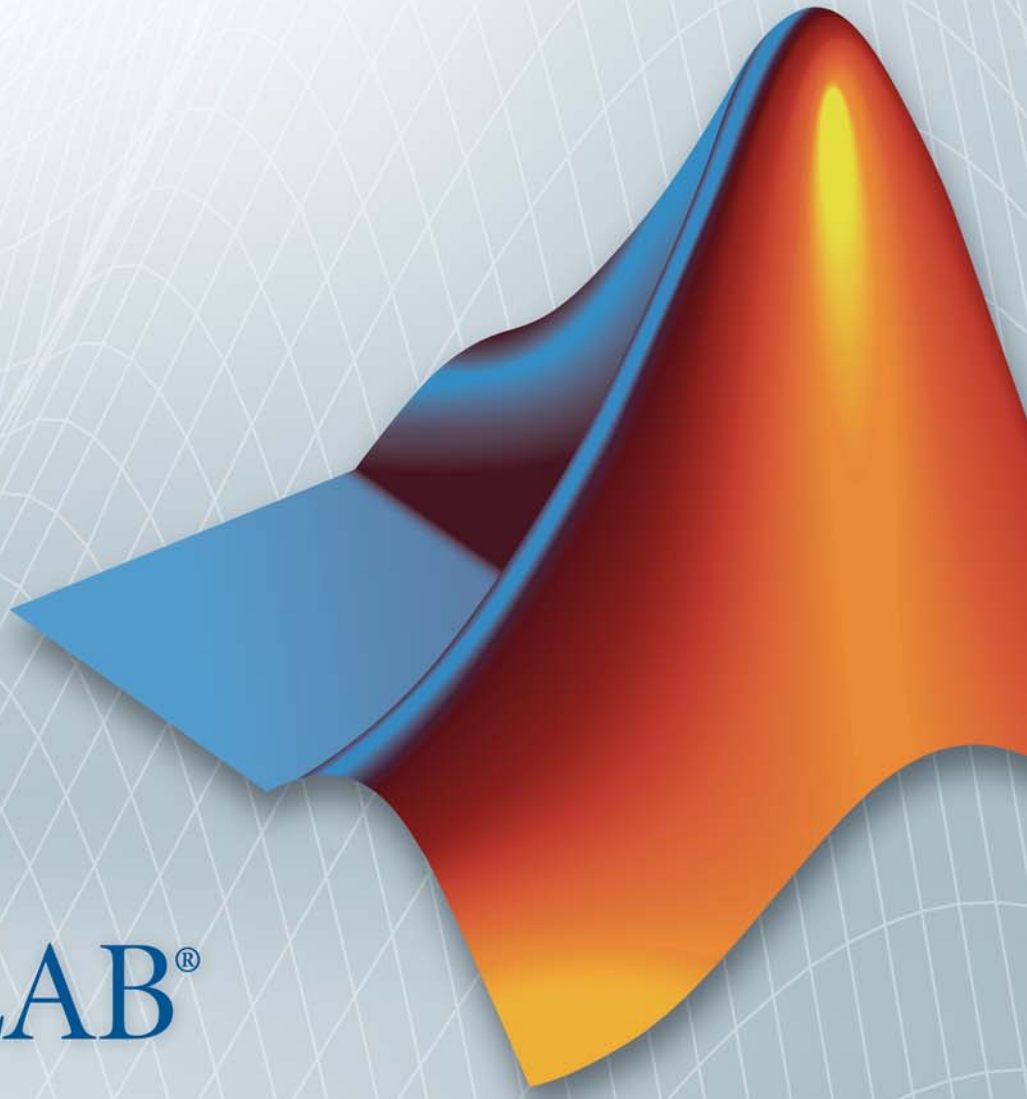
# Code Generation from MATLAB®

## Getting Started Guide

**R2011b**



MATLAB®

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508-647-7000 (Phone)

508-647-7001 (Fax)

The MathWorks, Inc.
3 Apple Hill Drive
Natick, MA 01760-2098

For contact information about worldwide offices, see the MathWorks Web site.

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**Revision History**

| | | |
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| October 2008 | Online only | New for Release 2008b |
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# Introduction to Code Generation from MATLAB


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# What Is Code Generation from MATLAB?

You can generate C/C++ and MEX code automatically from MATLAB® algorithms using the MATLAB® Coder™ product and from MATLAB Function blocks in Simulink® models.

With this capability, you can design, implement, and test software for embedded and desktop applications in the MATLAB environment, then automatically translate the algorithms to efficient C/C++ code for deployment to desktop and embedded systems. More than 350 MATLAB toolbox functions support code generation.

For more information, see “About Code Generation from MATLAB Algorithms” in the Code Generation from MATLAB documentation.

# When to Generate Code from MATLAB Algorithms

Consider generating code from MATLAB algorithms to:

- Produce readable, efficient, and compact code from MATLAB algorithms for deployment to desktop and embedded systems.
- Generate MEX functions from MATLAB algorithms to:
  - Accelerate your MATLAB algorithms.
  - Verify generated C code within MATLAB.
- Integrate MATLAB code into Simulink.
- Speed up fixed-point MATLAB code.
- Integrate custom C code into MATLAB.
- Generate hardware description language (HDL) from MATLAB code.

For the function, command, or block that applies, see “Which Code Generation Feature to Use” on page 1-4.

# Which Code Generation Feature to Use

| To... | Use... | Required Product | To Explore Further... |
|---|---|---|---|
| Generate MEX functions for verifying generated code | `codegen` function | MATLAB Coder | Try this in "Generating MEX Functions from MATLAB Code at the Command Line" in the MATLAB Coder documentation |
| Produce readable, efficient, and compact code from MATLAB algorithms for deployment to desktop and embedded systems. | MATLAB Coder user interface | MATLAB Coder | Try this in "Generating C Code from MATLAB Code Using the MATLAB Coder Project Interface" in the MATLAB Coder documentation |
| | `codegen` function | MATLAB Coder | Try this in "Generating C Code from MATLAB Code at the Command Line" in the MATLAB Coder documentation |
| Generate MEX functions to accelerate MATLAB algorithms | MATLAB Coder user interface | MATLAB Coder | See "Accelerating MATLAB Algorithms" in the MATLAB Coder documentation |
| | `codegen` function | MATLAB Coder | |
| Integrate MATLAB code into Simulink | MATLAB Function block | Simulink | Try this in "Tutorial: Integrating MATLAB Code with a Simulink Model for Tracking a Moving Object" in the Simulink documentation |

| To... | Use... | Required Product | To Explore Further... |
|---|---|---|---|
| Speed up fixed-point MATLAB code | `fiaccel` function | Fixed-Point Toolbox™ | Learn more in "Code Acceleration and Code Generation from MATLAB for Fixed-Point Algorithms" in the Fixed-Point Toolbox documentation. |
| Integrate custom C code into MATLAB and generate efficient, readable code | `codegen` function | MATLAB Coder | Learn more in "Generating C/C++ Code from MATLAB Code" in the MATLAB Coder documentation |
| Integrate custom C code into code generated from MATLAB | `coder.ceval` function | MATLAB Coder | Learn more in `coder.ceval` in the MATLAB Coder documentation |
| Generate HDL from MATLAB code | MATLAB Function block | Simulink and Simulink® HDL Coder™ | Learn more at `www.mathworks.com/products/slhdlcoder` |

# When Not to Generate Code from MATLAB Algorithms

Do not generate code from MATLAB algorithms for the following applications. Use the recommended MathWorks® product instead.

| To... | Use... |
|---|---|
| Deploy an application that uses handle graphics | "MATLAB Compiler™" |
| Use Java™ | "MATLAB® Builder JA" |
| Use toolbox functions that do not support code generation | Toolbox functions that you rewrite for desktop and embedded applications |
| Deploy MATLAB based GUI applications on a supported MATLAB host | "MATLAB Compiler™" |
| Deploy web-based or Windows® applications | • "MATLAB® Builder NE"<br>• "MATLAB® Builder JA" |
| Interface C code with MATLAB | MATLAB `mex` function |

# Benefits of Generating Code from MATLAB

Generating code from MATLAB for desktop and embedded systems allows you to perform your software design, implementation, and testing completely within the MATLAB workspace. In addition, it enables you to generate efficient, readable, and compact C code automatically from your MATLAB algorithms.

Within the MATLAB development environment, you can:

- Verify that your algorithms are suitable for code generation
- Generate C/C++ code automatically, which eliminates the need to manually translate your MATLAB algorithms and minimizes the risk of introducing errors in the code.
- Modify your design in MATLAB code to take into account the specific requirements of desktop and embedded applications, such as data type management, memory use, and speed.
- Test the generated code and easily verify that your modified algorithms are functionally equivalent to your original MATLAB algorithms.

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