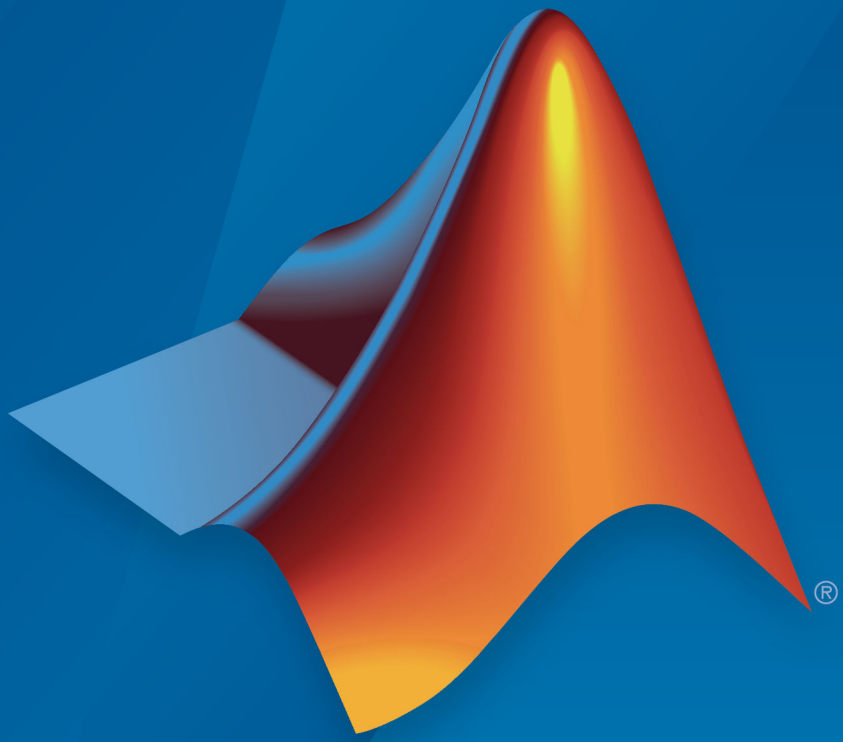
Robotics System Toolbox™

Getting Started Guide



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

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Product Overview

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Robotics System Toolbox Product Description

Design and test algorithms for robotics applications

Robotics System Toolbox provides algorithms and hardware connectivity for developing autonomous robotics applications for aerial and ground vehicles, manipulators, and humanoid robots. Toolbox algorithms include path planning and path following for differential drive robots, scan matching, obstacle avoidance, and state estimation. For manipulator robots, the system toolbox includes algorithms for inverse kinematics, kinematic constraints, and dynamics using a rigid body tree representation.

The system toolbox provides an interface between MATLAB® and Simulink® and the Robot Operating System (ROS) that enables you to test and verify applications on ROS-enabled robots and robot simulators such as Gazebo. It includes examples showing how to work with virtual robots in Gazebo and with actual ROS-enabled robots.

Robotics System Toolbox supports C++ code generation, enabling you to generate a ROS node from a Simulink model and automatically deploy it to a ROS network. Support for Simulink external mode lets you view signals and change parameters while your deployed model is running.

Key Features

- Map utilization, path planning, path following, and state estimation algorithms
- Robot localization and environment mapping using lidar sensors
- Rigid body tree kinematics and dynamics algorithms
- Bidirectional communication with live ROS-enabled robots
- rosbag data import, message extraction, and coordinate transformation
- ROS node generation from Simulink models (with Simulink Coder™)

Robotics System Toolbox Supported Hardware

As of this release, Robotics System Toolbox supports the following hardware. See “Get Add-Ons” (MATLAB) for information on installing add-ons and support packages. You can also use `roboticsAddons` for Robotics System Toolbox add-ons.

Support Package	Vendor	Earliest Release Available	Last Release Available
“Robotics System Toolbox Support Package for TurtleBot Based Robots”	TurtleBot	2016a	Current

View the Hardware Catalog for details on all supported hardware.

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Robot Operating System (ROS)

Robot Operating System (ROS)

Robot Operating System (ROS) is a framework of tools, libraries, and software to aid in robot software development. It is a flexible system for programming robots and controlling robotic platforms. ROS was developed by an open-source collaborative community to help grow the world of robotics. Applications for working with hardware, robotic simulation models, path planning, localization and mapping, and many other algorithms are available. For an introduction to ROS, see the ROS Introduction on their website.

For more information about ROS and its functionality, see the ROS Website and the ROS Wiki. The wiki contains documentation and tutorials for ROS, software packages, core libraries, and supported robots and hardware.

Robotics System Toolbox allows you to access ROS functionality in MATLAB. Use MATLAB to communicate with a ROS network, interactively explore robot capabilities, and visualize sensor data. You can develop robotics applications by exchanging data with ROS-enabled robots and robot simulators such as Gazebo. You can also create Simulink models that exchange messages with a ROS network. Verify your model within the Simulink environment by receiving messages from, and sending messages to, ROS-enabled robots and robot simulators. From your model, you can also generate C++ code for a standalone ROS application.

Both MATLAB and Simulink support the TCPROS transport layer (see TCPROS). The UDPROS transport is not supported.

Robotics System Toolbox supports ROS Indigo and Hydro platforms, but your own ROS installation may have different message versions. If you would like to overwrite our current message catalog, you can utilize the “Custom Message Support” to generate new message definitions.

The first thing to do when working with ROS is to set up or connect to a ROS network. Here is a link to an explanation of the ROS network setup and some examples to get started using ROS in MATLAB and Simulink:

MATLAB

- “ROS Network Setup”
- “Get Started with ROS”
- “Connect to a ROS Network”

Simulink

- “Get Started with ROS in Simulink®”
- “Configure ROS Network Addresses”
- “Connect to a ROS-enabled Robot from Simulink®”