Using MATLAB and Simulink in Robotics

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Agenda

- Using MATLAB and Simulink for
  - Building Robots
  - Developing Robotics Applications using Existing Robots
  - Teaching/Learning Robotics

- Demonstrating Robotics System Toolbox (R2015a, March 2015)
  - Robotics Algorithms
  - MATLAB-ROS Interface
  - Simulink-ROS Interface
What Are You Doing with Robotics?

1. Build Robots
2. Develop Robotics Applications Using Existing Robots
3. Teach/Learn Robotics

My Focus Today
Using MATLAB and Simulink for “Building Robots”

Recorded Webinar: How a Differential Equation Becomes a Robot

Festo Bionic Arm

DLR Humanoid Robot

YZU Robot Hand
Using MATLAB and Simulink for “Teaching/Learning Robots”

Build Robots with Low-Cost Hardware?
- No need C/C++/Python
- Drivers Provided
- Comprehensive Algorithms

Use Powerful Robots Running ROS?
- ROS/Gazebo Interface
- ROS Node Generation
- Comprehensive Algorithms

Hardware Support Package

Robotics System Toolbox

Visit:
www.mathworks.com/hardware

Visit:
www.mathworks.com/products/robotics
Using MATLAB and Simulink for “Developing Robotics Applications”

- What you have and need?

My computer + My MATLAB

1: Interface

2: Algorithms

Example: Develop a Human Robot Interaction Application

ROS

My Robot

Developing Robotics Applications using Existing Robots
Key Features of Robotics System Toolbox (v1.0)

- MATLAB-ROS Interface
- Simulink-ROS Interface
- Robotics Algorithms
- Comprehensive Demos
Demo…

Design and Test Robotics Algorithms with ROS-enabled Robots or Simulators (such as Gazebo)
Demo Overview: Design and Test Robotics Algorithms

Prototype algorithms (e.g., Path Planning) in MATLAB

Test algorithms with ROS-enabled Simulators such as Gazebo

Test algorithms on a Robot and analyze the performance with rosbag
Demo: Design and Test Robotics Algorithms

- Prototype a path-planning algorithm in MATLAB
Demo: Design and Test Robotics Algorithms

- Test it with Gazebo through MATLAB-ROS Interface
Demo: Design and Test Robotics Algorithms

- Test it with a physical robot running ROS
Demo: Design and Test Robotics Algorithms

- Analyze the performance by reading rosbag files

Switch to Demo
Key Capabilities Demonstrated

- **MATLAB-ROS Interface**
  - Create a ROS node inside MATLAB
  - Design and test robotics algorithms on a robot simulator such as Gazebo
  - Test robotics algorithms on a physical robot
  - Import rosbag log files into MATLAB

- **Simulink-ROS Interface (Refer to Doc Examples)**
  - Simulink I/O with ROS networks
  - ROS node generation from Simulink models

- **Algorithms in Robotics System Toolbox**
Robotics Algorithms with Other MathWorks Products

Computer Vision System Toolbox

Phased Array System Toolbox
Thank You…

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