

# Using MATLAB and Simulink in Robotics

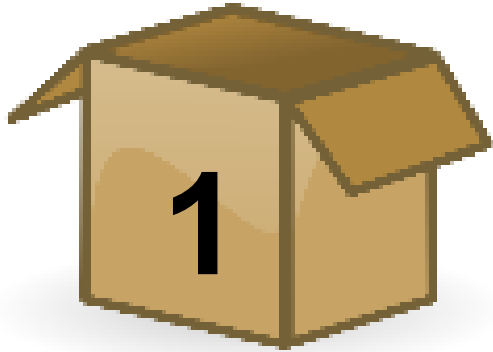
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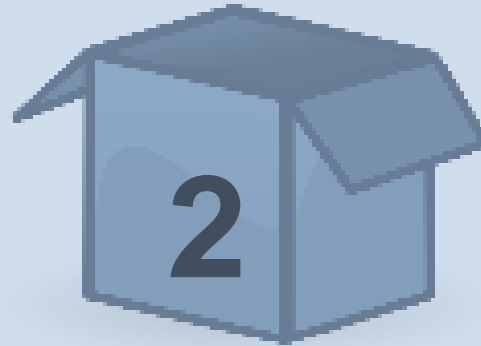
# Agenda

- **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?



Build  
Robots



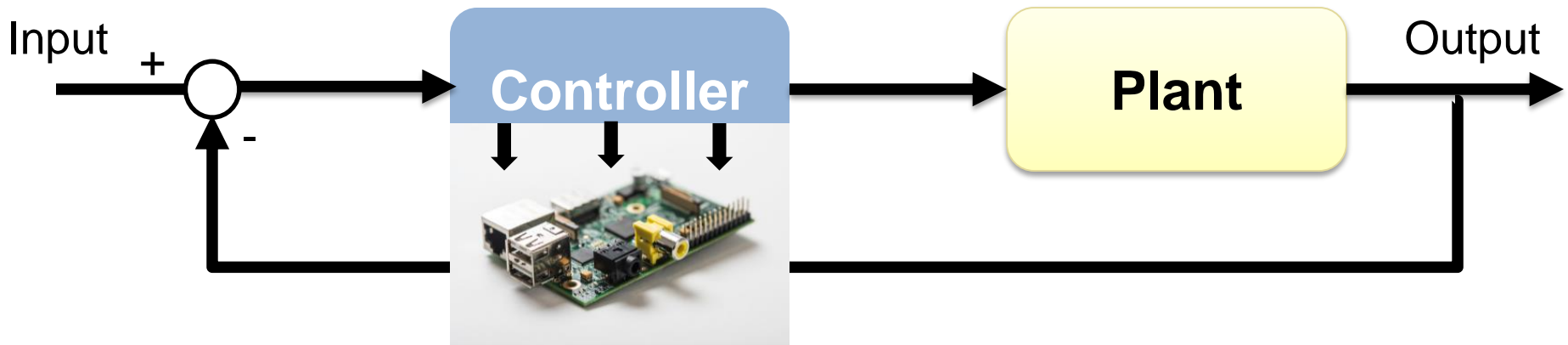
Develop Robotics Applications  
Using Existing Robots



Teach/Learn  
Robotics

**My Focus Today**

# Using MATLAB and Simulink for “Building Robots”



**Festo Bionic Arm**



**DLR Humanoid Robot**



**YZU Robot Hand**

Recorded Webinar: [How a Differential Equation Becomes a Robot](#)

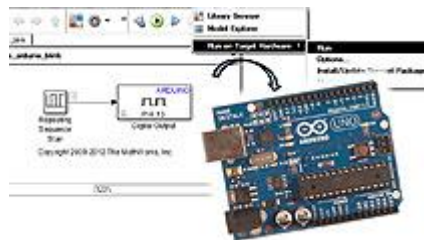
# Using MATLAB and Simulink for “Teaching/Learning Robots”

## Build Robots with Low-Cost Hardware?



- No need C/C++/Python
- Drivers Provided
- Comprehensive Algorithms

### Hardware Support Package

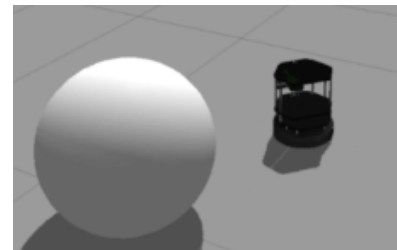


## Use Powerful Robots Running ROS?



- ROS/Gazebo Interface
- ROS Node Generation
- Comprehensive Algorithms

### Robotics System Toolbox



Visit:

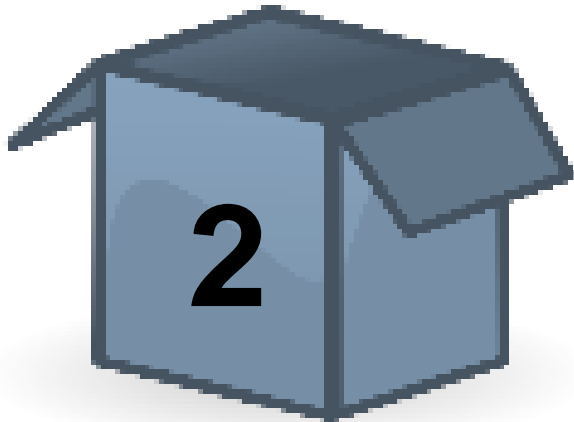
[www.mathworks.com/hardware](http://www.mathworks.com/hardware)

Visit:

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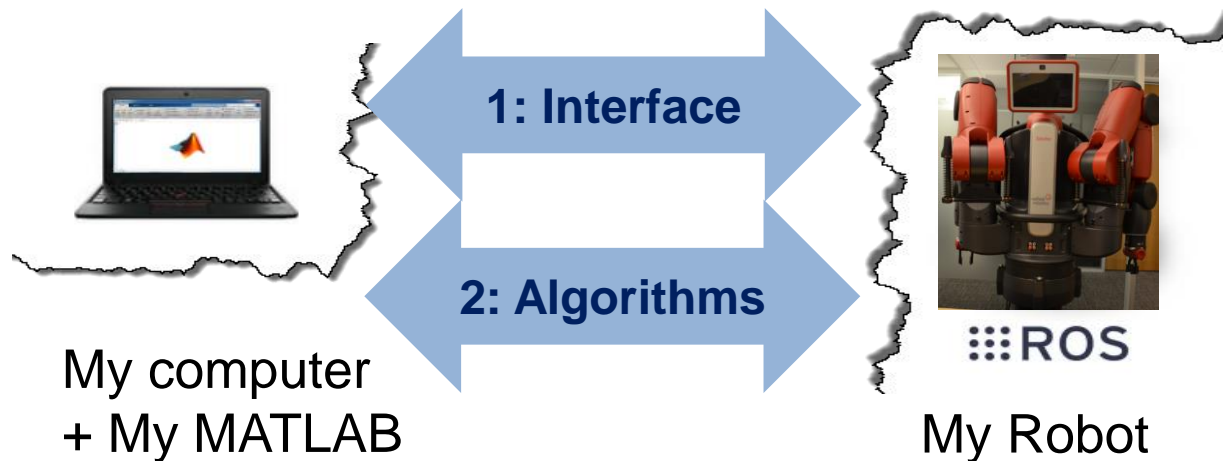
# Using MATLAB and Simulink for “Developing Robotics Applications”

- What you have and need?



**Example:**  
Develop a  
Human  
Robot  
Interaction  
Application

Developing Robotics  
Applications using  
Existing Robots





# Key Features of Robotics System Toolbox (v1.0)



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



ROS

## Demo...

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

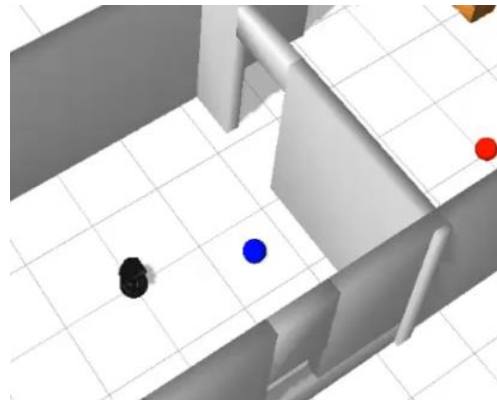
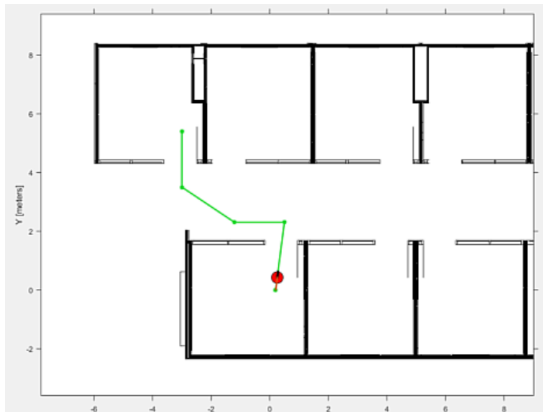


# Demo Overview: Design and Test Robotics Algorithms

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

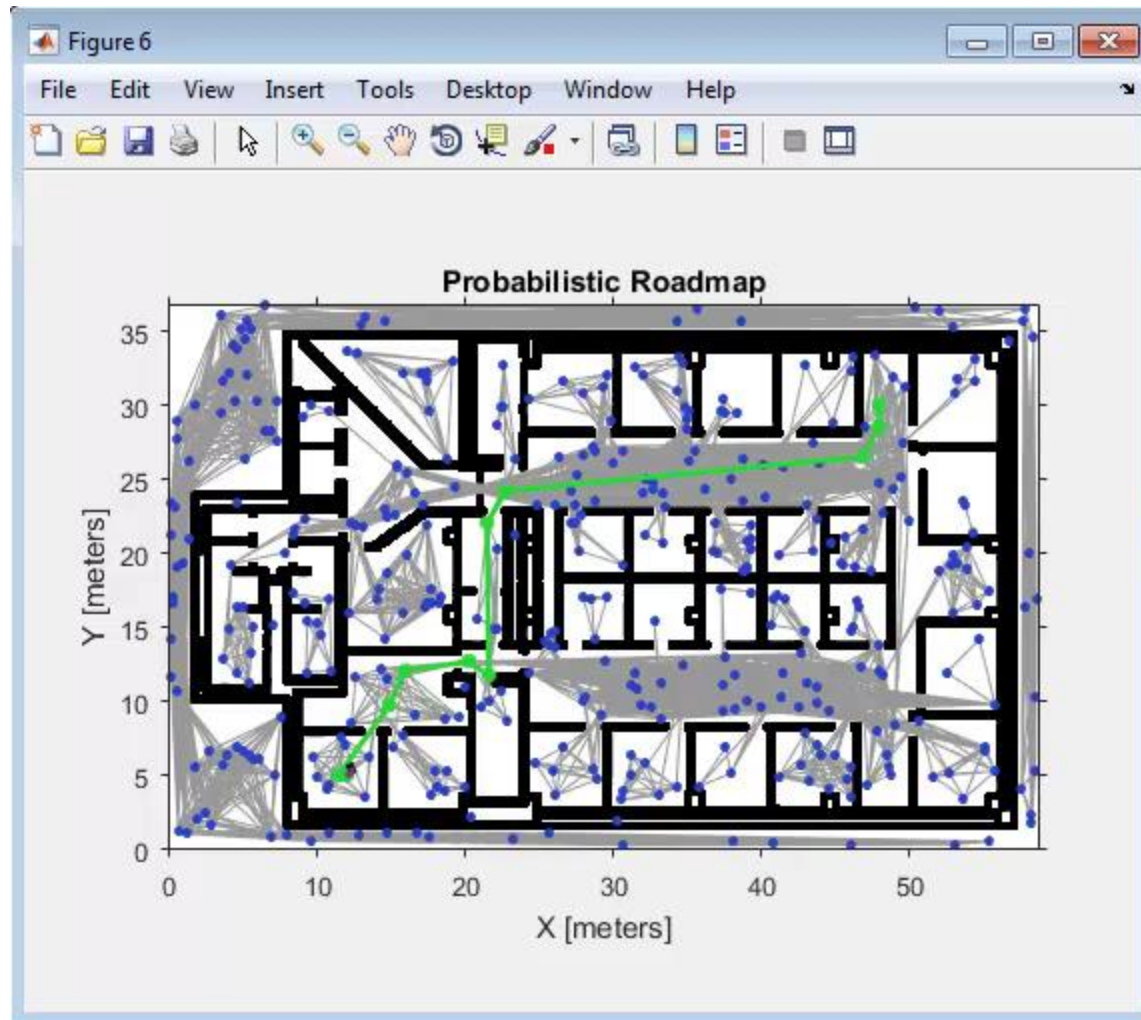
Test algorithms with ROS-enabled  
Simulators such  
as **Gazebo**

Test algorithms on  
a **Robot**  
and  
analyze the  
performance with  
**rosbag**



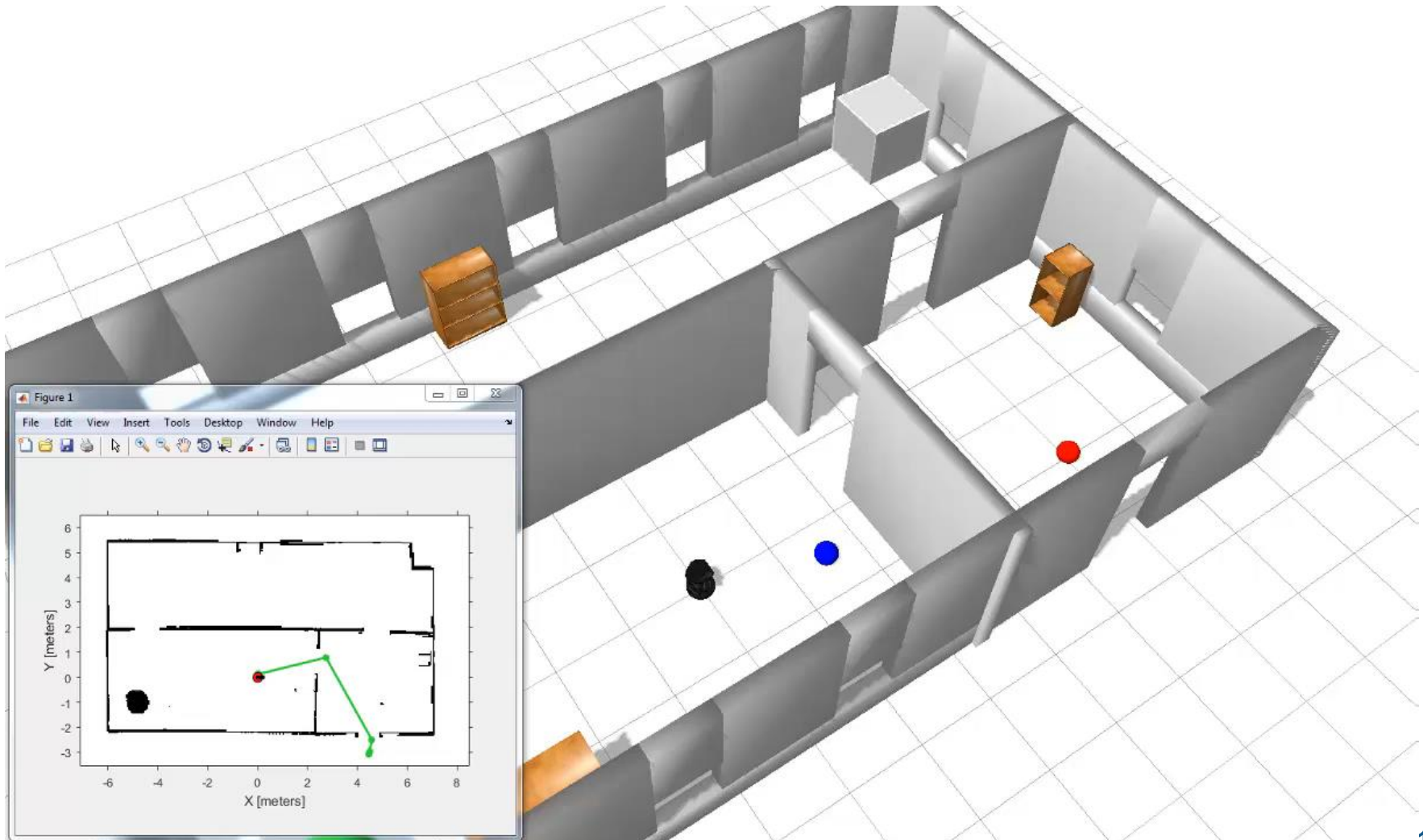
# Demo: Design and Test Robotics Algorithms

- Prototype a path-planning algorithm in MATLAB



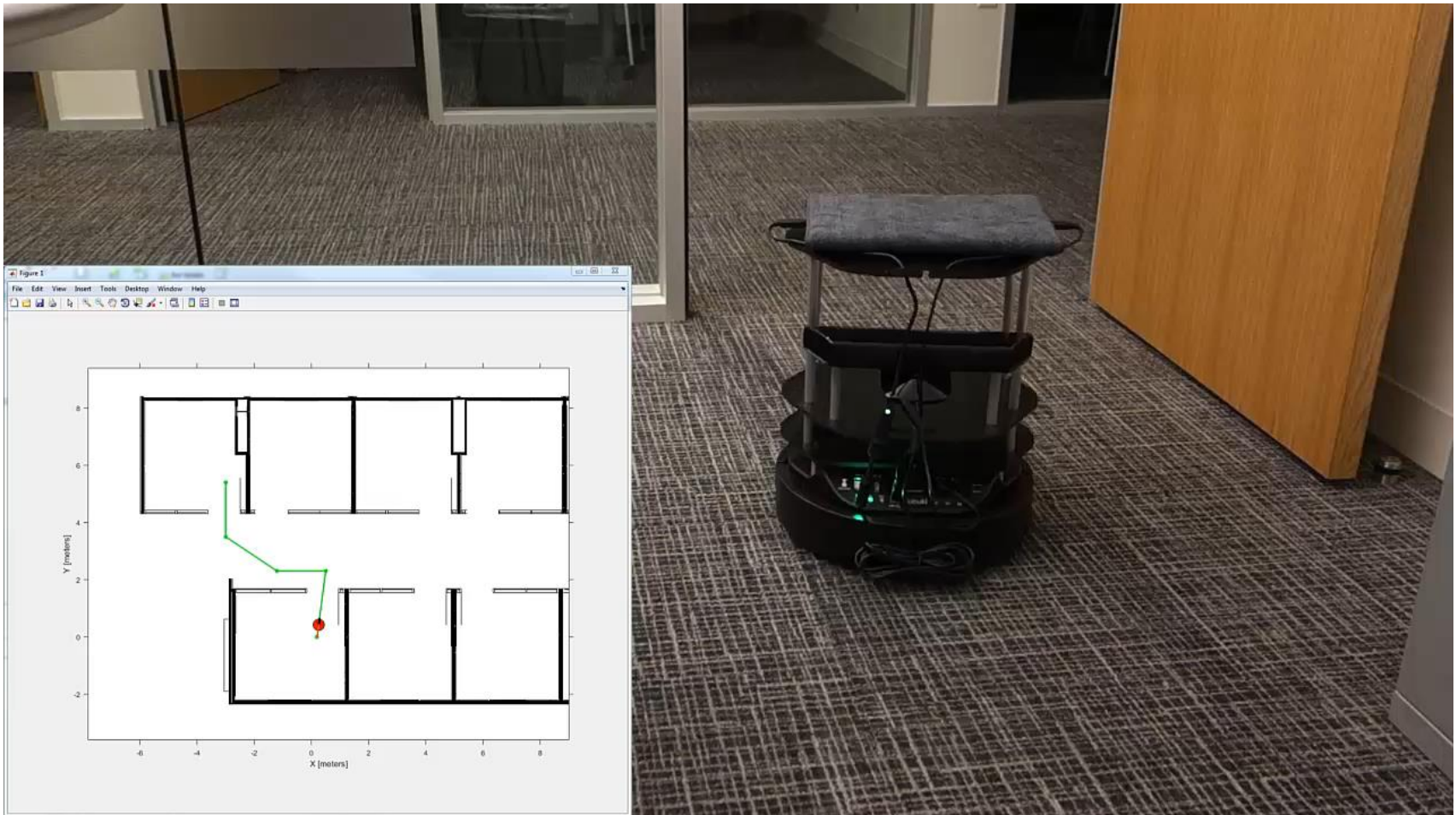
# Demo: Design and Test Robotics Algorithms

- Test it with Gazebo through MATLAB-ROS Interface



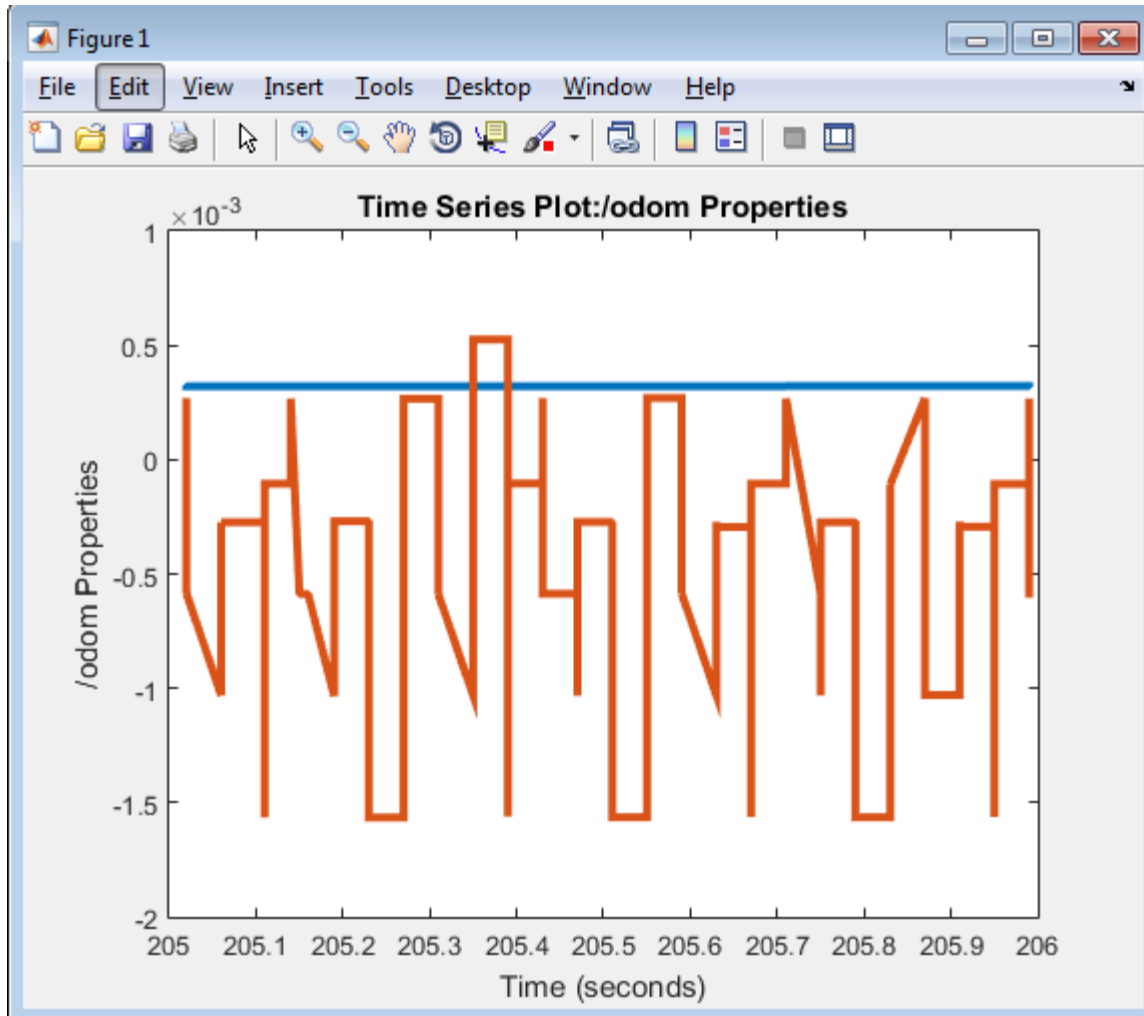
# Demo: Design and Test Robotics Algorithms

- Test it with a physical robot running ROS



# Demo: Design and Test Robotics Algorithms

- Analyze the performance by reading rosbag files



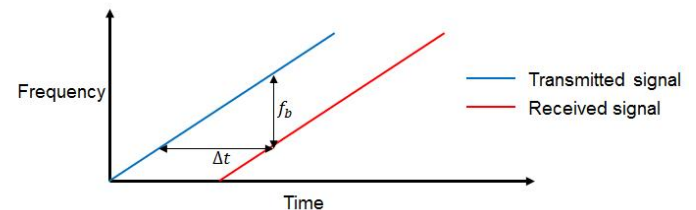
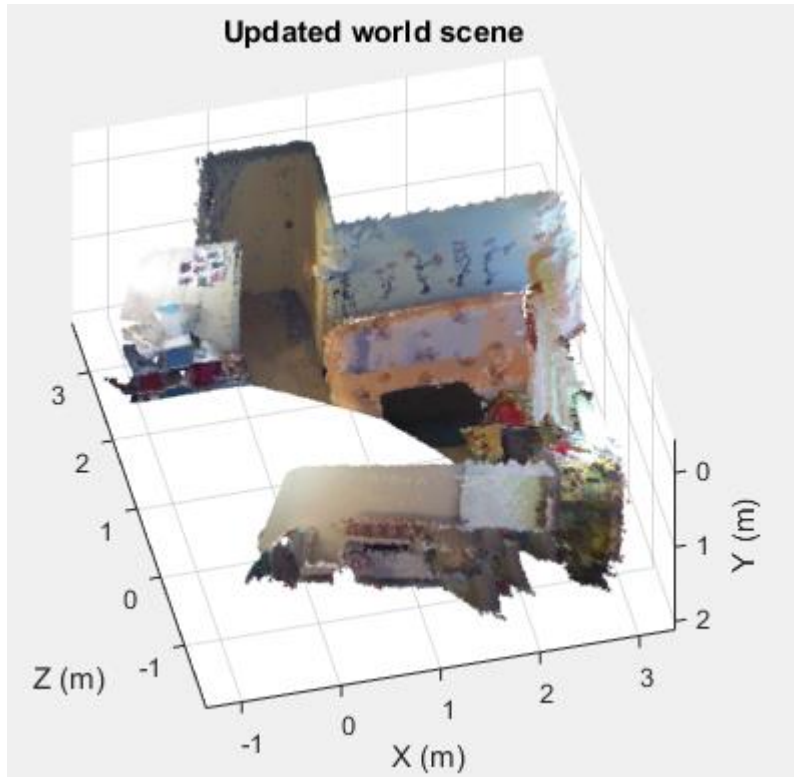
Switch to Demo 



# 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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