MATLAB Support for LEGO Mindstorms NXT

The LEGO® MINDSTORMS® NXT robotics invention system lets you create and control robots using programmable motors and sensors. Using MATLAB and a free, readily-available toolbox, you can control a NXT robot over a USB cable or Bluetooth wireless connection.

The LEGO MINDSTORMS NXT robotics system is a widely available robotics platform with an ARM processor, servo motors and a wide variety of digital and analog sensors. Designed for easy assembly by beginners without any engineering background, it is nonetheless powerful enough to create sophisticated robots and teach advanced concepts like closed-loop control systems and embedded systems.

MATLAB enables control of the LEGO NXT remotely over a USB cable or a Bluetooth wireless connection with a custom software toolbox, RWTH Aachen MINDSTORMS NXT Toolbox. With MATLAB and the free toolbox, you can:

- Start programming right away without any additional toolboxes
- Work in the MATLAB environment for interactive development and debugging
- Use MATLAB to visualize and analyze the sensor data
- Develop custom graphical user interfaces to control the robot

The RWTH Aachen MINDSTORMS NXT Toolbox supports the following capabilities:

- Control of multiple NXT robots
- Precise control of NXT servo motors, with ±1 degree accuracy
- I2C communication for digital low speed sensors
- LEGO NXT touch, sound, light and ultrasonic sensors
- HiTechnic compass, color, gyro, acceleration and infrared sensors
- Codatex RFID sensor
- NXT system features (e.g., play tone, get battery level)

Getting Started

Required hardware:

- LEGO MINDSTORMS NXT 1.0, NXT 2.0, or Education NXT Base set
- For wireless control, you need a Bluetooth USB adapter.

Required MathWorks products:

One of the following:

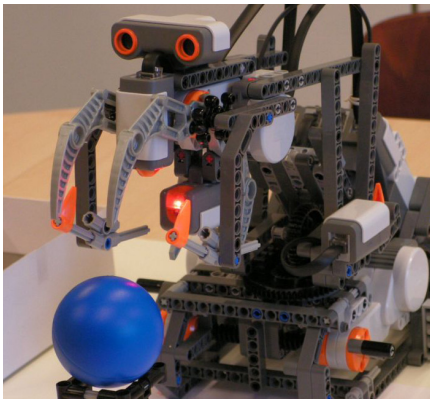
- MATLAB Version 7.7 (R2008b) or later
- MATLAB & Simulink Student Version 2009a or later

Required third-party software:

- RWTH Aachen MINDSTORMS NXT Toolbox, available at the RWTH Aachen LEGO MINDSTORMS Web site.

Online Resources

- Details and links to downloads on the MathWorks LEGO MINDSTORMS NXT page:
  mathworks.com/academia/lego-mindstorms-nxt-software
- Resources for teaching with MATLAB & Simulink:
  mathworks.com/academia/classroom-resources
- RWTH Aachen LEGO MINDSTORMS Web site:
  www.mindstorms.rwth-aachen.de
- Resources for project-based learning with MATLAB & Simulink
  mathworks.com/academia/hardware-resources/



```
function CloseGrabber()
% Closes the grabber of RoboArm

%% parameter settings
GrabberPort  = MOTOR_A;
GrabberPower = 30;

%% update side view graphic
DrawSideView(' closing grabber ');

%% close grabber claw
SetMotor(GrabberPort);
    SetPower(GrabberPower);
    SetAngleLimit(0);
    SpeedRegulation('on');
SendMotorSettings;

pause(1); % wait some time

StopMotor(GrabberPort, 'brake');

%% update side view graphic
DrawSideView('', 'Grabber', 'closed');

end
```

A LEGO robot that can pick up a ball (far left), with corresponding MATLAB code using the RWTH Aachen MINDSTORMS NXT Toolbox (left)

QUESTIONS AND COMMENTS:
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