Getting started with Matlab and Mindstorms

Overview

Matlab has provided a free software kit to manipulate the Lego Mindstorms NXT module via a bluetooth connection. This kit allow starting and stopping programs on the NXT. Reading sensors values back to Matlab and control of the motor ports on the module. This kit allows the development of much more sophisticate control schemes to be used when creating systems with the NXT module.

The NXT provides a mailbox system to send and receive data between NXT devices and a computer. This mailbox system is not implemented on the standard Matlab Lego Mindstorms software but has been augment for the use of our university students. The augmented functions have been provided on the systems in the Computer lab, MEB2555. Access to these functions for personal installations of Matlab can be provide by contacting Bryan Stenquist, <u>bstenqui@ece.utah.edu</u>.

The link to get the software is http://www.mathworks.com/programs/lego-mindstorms-nxt-software/

Getting connected

To connect the NXT to computer in the labs requires a bluetooth dongle that is checkout with the robot. Each of the machines in the lab should have the Bluetooth software installed. To connect to the NXT do the following

- 1. Plug in the Bluetooth device
- 2. Launch the BlueSoleil device software using the icon on the desktop

or Start->all programs->IVT BluSoleil->BlueSoleil

5.

- 3. Turn on the Lego NXT
- Search for the NXT using the discovery option under the My Bluetooth->Bluetooth device Discovery



6. Pair the NXT with the computer by right clicking on the device icon for the NXT





- 7. The NXT will beep and indicate a Passkey of 1234 use this value by pressing the orange button.
- 8. Enter the pairing key in the Passkey dialog of BlueSoleil.

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9. Now that the device is paired, the port to communicate with the NXT must be connected. Right click on the device icon and select **Refresh Services**. The serial port icon at the top of the window should turn yellow with a box arround it. This indicates the service is available.



10. Double click the serial port icon to connect to the NXT. If the connection in unavailable than then turn the NXT off and back on and try to connect again.



- 11. The NXT is now ready to be controlled from Software on the computer.
- 12. Find out the COM port being used for connection by right clicking on the device icon and selecting status. The status shows the COM port being used for the serial port service. Take note of the port number because you will need it to connect from Matlab

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	Device Name: ECE2	
	Status: Connected.	
	Duration: 00:19:06	and the second se
	Paired: Yes	
	Role: Slave	
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4	Properties Disconnect Uppair	
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Test the NXT setup

Matlab provided a basic set of functions to control serial ports on a computer. A virtual serial port was created by the pairing and connection of the bluetooth serial port service on the NXT. This serial port connection is used by the Lego Mindstorms toolbox to control the NXT

To test control of the NXT from Matlab the toolbox provide a demo application to monitor all the sensor ports and control the motor ports.

- 1. Launch Matlab and set your working directory to the location of the tool box
- 2. Type nxtdemo('COMx'); where x = the COM number of the bluetooth service
- 3. Matlab will prompt:

Opening Serial port (COM20) ... This may take a few seconds KeepAlive message sent to the Lego NXT

The nxtdemo window should launch and look as follows



- 4. Verify one of the motors is working by setting the second slider to 20 (ie.. 20% power) and pressing run. Stop the motor by moving the slider to a different value. Repeat at for the third slider.
- 5. The robot is built to have a sound sensor connected to port 2. Select the sound sensor from the pull down menu for port2 and note the graphed response to the noise level.
- 6. An ultrasonic distance sensor is connected to port 4. Select the sensor from the port 4 pull down and note the way the level changes as you reach your hand toward the sensor.



This concludes the connection and testing of the NXT device using Matlabs Lego Mindstorm NXT toolbox