

CS 4758/6758

Introduction to ROS

Marcus Lim (mkl65)

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What is ROS?

- Robot Operating System
- Framework for robot software development
- OS-like functionality:
 - Hardware abstraction / drivers
 - Message passing between processes
 - Package management
- Huge community of developers:
 - Freely available packages

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Installing ROS

- Supported: Ubuntu
- Experimental: OS X, Fedora, OpenSUSE etc.
- Partial functionality: Windows
- Installation instructions at:
 - <http://www.ros.org/wiki/ROS/Installation>
- Latest stable version: C turtle
 - Diamondback to be released this month

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ROS Components

- File system – How program files are organized and built
- Computation graph – how programs run
- Repositories – How files are distributed online

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ROS Computation Graph

- Master – Name registration and lookup
- Nodes – Processes that perform computation
- Parameter server – Server that stores key-value pairs
- Message – Data structure for inter-process communication
- Topic – Channel for communication
- Services – Remote Procedure Call (RPC)
- Bags – Used to store messages for "playback"

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Simple Example

- Two nodes:
 - Talker
 - Listener
- One channel:
 - /chatter



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ROS Tools



- `roscat pkg package-name dependency1...N`
 - Creates a new ROS package
- `rospack`
 - Find and get information about ROS packages
- `roscd package-name`
 - Just like `cd`, change to the package directory
- `rosmake package-name 1...N`
 - Makes the package(s)

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Starting ROS programs



- `roscat`
 - Starts: Master, parameter server
- `roslaunch package-name executable-name`
 - Runs the specified executable in the specified package
- `roslaunch`
 - Launches many nodes at once using an xml file
 - <http://www.ros.org/wiki/roslaunch/XML>
- `rostopic`
 - Shows the computation graph

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Example: Turtlesim



- `roslaunch turtlesim turtlesim_node`
- `roslaunch turtle_teleop_key turtle_teleop_key`
- `rostopic`

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Writing ROS Software



- Tutorials available at:
 - <http://www.ros.org/wiki/ROS/Tutorials>
- We will be going through:
 - Create package
 - Publisher and Listener
 - Client and Server

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Create Package



- `roscat pkg beginner_tutorials std_msgs rospy roscpp`
- Creates a package called `beginner_tutorials` that depends on the packages `std_msgs`, `rospy` and `roscpp`
- Generates two important files:
 - `CMakeLists.txt`
 - Specifies source files for compiling
 - `manifest.xml`
 - Specifies package dependencies

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Example: Publisher and Listener



- Follow the tutorial at:
 - <http://www.ros.org/wiki/ROS/Tutorials/WritingPublisherS>

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Example: Publisher and Listener



- More tools:
- rosmmsg
 - rosmmsg show Show message description
 - rosmmsg users Find files that use message
 - rosmmsg md5 Display message md5sum
 - rosmmsg package List messages in a package
 - rosmmsg packages List packages that contain messages

Example: Client and Server



- Follow the tutorial at:
 - <http://www.ros.org/wiki/ROS/Tutorials/WritingServiceCli>