

# Introduction to Robotics

## ROS practical session

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# ROS pkg structure<sup>1</sup>

- ROS packages tend to follow a common structure
- For python code it will look like this:

```
carlos@cthinkpad:AutSysPKG $ tree
.
├── CMakeLists.txt
├── common
│   └── src
│       └── AutSysPKG
│           ├── __init__.py
│           └── my_ros_independent_class.py
├── package.xml
└── ros
    ├── config
    │   └── config_AutSysPKG.yaml
    ├── doc
    │   └── README.md
    ├── launch
    │   └── AutSysPKG.launch
    ├── scripts
    │   └── AutSysPKG_node
    ├── src
    │   └── AutSysPKG_ros
    │       └── AutSysPKG_node.py
    └── test
        └── AutSysPKG_test.py

1 setup.py
```

<sup>1</sup><http://wiki.ros.org/Packages>

## rosbash<sup>2</sup>

- Offers a set of shell commands for using ros with bash (linux terminal)
- Most popular include:
  - ▶ `roscd pkg_name` (cd to `pkg_name` easily)
  - ▶ `rosed pkg_name filename` (quickly edit a file)
  - ▶ `roscat pkg_name filename` (quickly visualize a file in terminal)
  - ▶ `rosrun pkg_name executable` (run executable from anywhere without having to give its full path)
- Enables tab completion on: `roslaunch`, `rosparam`, `rosnode`, `rostopic`, `rosservice`, `rosmsg`, `rossrv`, `rosbag`.

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<sup>2</sup><http://wiki.ros.org/rosbash>

## rosrun<sup>3</sup>

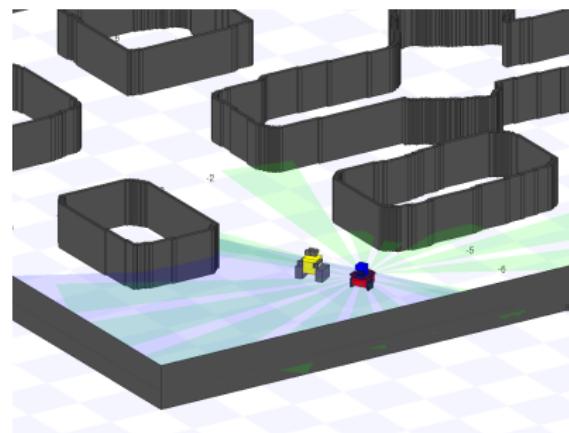
- Part of rosbash suite
- Usage: `rosrun pkg_name executable_name`
- It will run ONLY executable files
- About files being executable (important!)
  - ▶ make sure your python nodes (i.e. `my_python_node.py`) are executable
  - ▶ check by doing: `ls -l`, if it has an x is executable (i.e. `-rwxr--r-`)
  - ▶ alternatively, if your terminal has colors, the file shows green when doing `ls`
  - ▶ `rosrun` will also look for your compiled c++ executables (under `devel/lib/pkg_name`)

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<sup>3</sup><http://wiki.ros.org/rosbash#rosrun>

## Stage simulator<sup>4</sup>

- Simulates a population of mobile robots, sensors and objects in a two-dimensional bitmapped environment
- Stage was designed with multi-agent systems in mind, so it provides fairly simple, computationally cheap models of lots of devices rather than attempting to emulate any device with great fidelity.



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<sup>4</sup><http://playerstage.sourceforge.net/index.php?src=stage>

## rostopic<sup>5</sup>

- Displays information about ROS topics
- Most useful:
- rostopic list (get a list of active topics)
- rostopic info topic\_name (get topic type, publishers and subscribers)
- rostopic echo topic\_name
- rostopic pub topic\_name topic\_type msg\_press\_tab! (publish a topic from console), options:
  - ▶ no args (latched)
  - ▶ -r float\_number (at a certain rate)
  - ▶ - -once (latch for 3 secs, then dies)
- rostopic hz topic\_name (get the publish frequency rate)

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<sup>5</sup><http://wiki.ros.org/rostopic>

## roslaunch<sup>6</sup>

- A tool for easily launching multiple ROS nodes
- Implemented with XML syntax (<launch>... </launch>)
- Allows to load parameters to param server
- A launch file can call other launch files
- Launch a node <node pkg="..." type="..." name="..." respawn=true ns="..." />
- Run syntax: `roslaunch pkg_name my_file.launch`

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<sup>6</sup><http://wiki.ros.org/roslaunch>

## parameter server<sup>7</sup>

- Is a shared, multi-variate dictionary that is accessible via network API
- Nodes can use this server to store or retrieve parameters during runtime
- Is not high performance
- Globally viewable
- Usage from terminal: `rosparam set param_name param_value`,  
`rosparam get param_name`
- Usage from python api: `rospy.set_param(param_name, param_value)`,  
`rospy.get_param("param_name")`
- Suitable for static, non-binary data such as configuration parameters

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<sup>7</sup><http://wiki.ros.org/Parameter%20Server>

# Rviz<sup>8</sup>

- 3D visualization tool
- Powerful for topic visualization (useful in debugging)
- Sensoring state information (laser scans, pointclouds, coordinate frames, cameras)
- Can publish some topics (2D pose estimate, 2D nav goal)
- Is recommended to comply with ROS standard topics to enable topic visualization
- Launch using : `rosrun rviz rviz` (a `roscore` must be running)
- Not a simulator

<https://www.youtube.com/watch?v=i--Sd4xH9ZE>

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<sup>8</sup><http://wiki.ros.org/rviz>

Questions? :)