ROS-I Basic Training “Mobility”
ROS Basic Tools Tutorial

Instructor: M. Stuettgen, N. Limpert

August 1, 2017

FH AACHEN
UNIVERSITY OF APPLIED SCIENCES

Contents

1 Introduction

During this tutorial, you will get to learn about the basics of the ROS parameter server. Further more, a brief introduction Transforms (TF) is given. Finally the most important visualization tool in ROS, *RVIZ*, and a composition of analyse/introspection/debugging tools called *RQT*, are introduced

- Lines beginning with $ are terminal commands
- Lines beginning with # indicate the syntax of the commands

2 Terminal usage

- opening a new terminal : ctrl+alt+t
- opening a new tab inside an existing terminal : ctrl+shift+t
- killing an active process inside a terminal: ctrl+c

3 Parameter Server

The parameter server stores and retrieves parameters of ROS nodes at runtime. It is suitable for static data. The parameter server is accessible via:

- command line
- launch file
- ROS node

Set your **ROS_MASTER_URI** to the IP of the robot. This way, you tell your system, that the roscore is running on a different machine.

```
export $ROS_MASTER_URI=http://<ip-of-robot>:11311
```

Hint: This can also be added to .bashrc for auto-set.

3.1 Access via command line

List all active parameters within the ROS Parameter Server:

```
  $ rosparam list
```

By executing this command, a list of the current parameters on the parameter server is displayed. The former part is a namespace and depends on the name of the running process. Hint: You can change the default name of a running process using a launch file.
Get the actual value of a specific parameter:
# rosparam get <param_name>
Store a value to the ROS Parameter Server:
# rosparam set <param_name> <value>

3.2 Access via launch file

Parameters can also automatically on startup in combination with launch-files. We are going to need that later.

Example:

```
<launch>
  <node name="node_name" pkg="package_name" type="node"
                         output="screen">
    <param name="parameterA" value="somevalue" />
    <param name="parameterB" value="anothervalue" />
  </node>
</launch>
```

4 RVIZ

RVIZ is a powerful visualization tool, that should already be installed in your ROS environment. Start RVIZ by typing:

```
$ rosrun rviz rviz
```

or just

```
$ rviz
```

The first thing to do after startup is setting the fixed-frame in the global options to a frame, that actually exists, otherwise no data can be displayed!
After the fixed frame is correctly set, use the *add* button to visualize the sensor data of the robot:

- Grid
- Transforms
- Odometry
- IMU
- LaserScan

Ask our crew to let you drive around with the robot to see how the data changes in RVIZ when the robot moves.

5 RQT

RQT is a collection of tools for introspection/debugging/analysing/visualizing robot data. RQT can be startet by typing

```
$ rosrun rqt rqt
```

or just

```
$ rqt
```

Since we cannot cover all its functionalities, here are two very useful tools within the suite:

5.1 RQT plot

RQT plot allows easy plotting of sensor data for fast analysis, even if there is no visualization plugin available for RVIZ.
RQT plot can be startet by clicking on Plugins → Visualization → Plot within the RQT suite or by typing:

```
$ rosrun rqt_plot rqt_plot
```

or just

```
$ rqt_plot
```

Use *rostopic list* to identify some sensor data that you would like to be plottet and then view in in rqt_plot !
Hint: Some sensor messages consist of several sub-messages, that can be accessed by a / in rqt_plot.
Example: The topic */imu/data/* is of type <sensor_msgs/Imu>, which consists ob sub-messages and cannot be plottet directly. To access e.g. the linear acceleration on the x-axis you have to use
/imu/data/linear_acceleration/x
in rqt_plot.

5.2 RQT TF tree

A tool that comes in very handy when trying to figure out what might be wrong with your transformations is *rqt_tf_tree*. It subscribes to the /tf topic and generates a PDF displaying the currently active TF Tree. It is also a nice tool to see which node is broadcasting which transform.

RQT TF Tree can be startet by clicking on Plugins → Visualization → TF Tree within the RQT suite or by typing:

```
$ rosrun rqt_tf_tree rqt_tf_tree
```

or just

```
$ rqt_tf_tree
```

5.3 RQT Graph

A Tool similar to RQT TF Tree, but this one visualizes the nodes that are currently active and the topics they are using to communicate.
RQT Graph can be startet by clicking on Plugins → Visualization → Node Graph within the RQT suite or by typing:

```
$ rosrun rqt_graph rqt_graph
```

or just

```
$ rqt_graph
```