MU4RBR04 - ROS et robotique expérimentale

Tutorials part 2

Tutorials Part 2 : URDF, visualisation (RVIZ) and simulation (GAZEBO)

After phase 1 of this teaching unit, you should now master the basic concepts of ROS.

The goal of this second phase is to use these basic skills to program a sensorimotor task for a simulated, then real, robot. Two tasks will be programmed: the first one corresponds to an essential safety mechanism, where the robot will have to be able to stop at any time if an obstacle appears in its path. The second task will be a line following task allowing the robot to automatically follow a pre-defined path.

In order to perform this kind of elementary tasks, it will be necessary:

• to understand and manipulate the universal declaration format that the ROS environment proposes to use, i.e. the URDF format (Unified Robot Descriptor Format) as well as the functioning of XACRO which allows to simplify the writing of this format ;

• to understand and exploit the physical simulator we will be using in the following, i.e. GAZEBO

• to be comfortable with the visualization tool (RVIZ) and ROSBAG in order to prototype and debug more easily your control algorithr

URDF

The URDF is a ROS specific standardized XML format for representing the model of a robot using basic geometries and linkages between them. It allows to have a code-independent, human-readable way to describe robots. It takes into account the dynamics of different parts of the robot and their interactions (mechanical linkages, elasticity, viscosity, etc.). An external mesh-file could also be associated for display purposes.

As in phase 1, it is **mandatory** for you to carefully follow the following ROS tutorial as it will practically explain how URDF and XACRO work together.

This thus constitutes mandatory homework, and you have about 2 weeks to complete the tutorials.

In the meantime, a discussion forum is made available on Moodle and all your teachers will be there to respond to the questions you might have. In the end of the tutorial period, your knowledge and understanding of the URDF format and Gazebo simulation will be assessed **through multiple choice questions on Moodle.**

The tutorial is available at http://wiki.ros.org/urdf/Tutorials and you have to work on the tutorials from the section "Learning URDF Ste by Step" :

• Building a Visual Robot Model with URDF from Scratch

• Building a Movable Robot Model with URDF

• Adding Physical and Collision Properties to a URDF Model

• Using Xacro to Clean Up a URDF File

• Using a URDF in Gazebo

In addition, it is very important that you review the tutorials on recording and using rosbag but also that you familiarize yourself throughout the previous tutorials with the use of the Rviz viewing tool.

- http://wiki.ros.org/ROS/Tutorials/Recording%20and%20playing%20back%20data

- http://wiki.ros.org/ROS/Tutorials/reading%20msgs%20from%20a%20bag%20file

At the end of these tutorials, you are supposed to precisely know:

• the different parts of a Robot description file (URDF file);

  – Geometry description of links

  – Inertial description

  – Mechanical description of joints

• Basic knowledge about Gazebo and how to make a robot model spawn in a Gazebo simulation

Alternatively or additionally, you can follow the following tutorials that present the same thing in a different way:

- you can follow the tuto on this page (https://www.generationrobots.com/blog/en/robotic-simulation-scenarios-with-gazebo-and-ro from the "Creating your own model" part to the end.

- The three followings pages guide you through the creation of a similar two wheeled robot :

https://www.theconstructsim.com/exploring-ros-2-wheeled-robot-part-01/ ;
https://www.theconstructsim.com/exploring-ros-2-wheeled-robot-part-02-xacros/ ;
https://www.theconstructsim.com/ros-projects-exploring-ros-2-wheeled-robot-part-3-urdf-laser-scan-sensor/

- For those who would like to go deeper and with a different application (creating a robotic arm), it is advisable to follow the tutorials explained in the following videos:

https://www.theconstructsim.com/ros-projects-robotic-manipulator-part-1-basic-urdf-rviz/

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◄ How-to operate the Turtlebot 3 burger

Aller à...

MCQ on part 2 ►

Aide et documentation

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