Assignment 4

The purpose of this assignment is to learn how to model a robot in URDF, an XML based robot description format.

# Getting ready

Install required URDF packages:

* *sudo apt-get install ros-indigo-urdf ros-indigo-urdf-tutorial liburdfdom-tools*

Study URDF (<http://www.ros.org/wiki/urdf> ) the Unified Robot Description Format and the XACRO (<http://wiki.ros.org/xacro>) macro language. Carefully study the basics of modelling in URDF as described on <http://wiki.ros.org/urdf/XML/model>. From the URDF tutorials at <http://wiki.ros.org/urdf/Tutorials>, do at least the ones under “*Learning URDF Step by Step*”.

For more information see lecture slides and following pointers:

* <http://www.cse.wustl.edu/~dvl1/publications/URDFandYou.pdf>
* <http://wiki.ros.org/urdf/Examples>

# The Task

Your task is to develop a model of the *Lynxmotion AL5B* robotic arm (with Base v2 and without Wrist rotate). Information such as dimensions and specs can be found on following links:

* AL5B specs  
  <http://www.lynxmotion.com/images/jpg/al5bbd.jpg>
* AL5B Information  
  [http://www.lynxmotion.com/driver.aspx?Topic=assem01#al5b](http://www.lynxmotion.com/driver.aspx?Topic=assem01" \l "al5b)
* Kinematics for Lynxmotion Robot Arm  
  <http://www.hessmer.org/uploads/RobotArm/Inverse%2520Kinematics%2520for%2520Robot%2520Arm.pdf>
* Tic-Tac-Toe Playing Robotic Arm  
  <http://www.hessmer.org/robotics/lynxmotion-robotic-arm.html>

Create a new package “*assignment4*”. In this package you need to create:

* ‘*lynxmotion.urdf.xacro’* file in the subdirectory *‘urdf’*
  + A URDFmodel of the Lynxmotion arm, with XACRO used (at least) for defining parameters.
* ‘*assignment4.launch*’ file in the subdirectory ‘*launch’*
  + A launch file to test the model. It should publish your model as ‘*robot\_description*’ parameter and should start a ‘*joint\_state\_publisher*‘ node in GUI mode to simulate a robot controller, a ‘*robot\_state\_publisher*’ node that publishes the actual states of the joints on TF, and ‘*rviz’* to visualize the current pose of the robot.

General requirements:

* Links must only have a *<visual>* section. No need to specify *<inertial>* and *<collision>* sections.
  + Visualization can be kept basic, i.e. it is ok to only use *<box>* and *<cylinder>*.
* Joints must only have *<origin>*, <*parent*>, <*child*>, <*axis*> and <*limit*> sections.
  + Only upper and lower limit need to be defined in the <*limit*> section.

Hints:

* First model the parent/child structure of your robot, without worrying about visualization. Then fill in the details (origin, axis) of the joints. Finally work out the links and their visualization. See this tutorial: <http://wiki.ros.org/urdf/Tutorials/Create%20your%20own%20urdf%20file>

# What to Submit

Your submission for this assignment must have two parts:

1. The source code, i.e. a zip (or rar) file containing the package
2. Documentation which must include a screendump of your robot in RVIZ..