XACRO Basics

Estimated time to completion: **7 minutes**

7.2 Basics on Using XACRO

XACRO files are an extension of URDF files. They provide a convenient way to generate URDF description elements by defining elements once and using them as many times as needed. While processing the XACRO file, each call to a macro will generate the corresponding URDF code. This simplifies the coding of robot models, reduces the amount of work required when making changes, and reduces the chance of errors, all while having a more compact description file. In addition, conditional statements let you code robot components that are generated or not, depending upon conditions evaluated at processing time. These conditions generally test values that can be defined, set, and changed from launch files. XACROs also give some tools for making basic mathematical operations inside the URDF files.

For a file to be a valid XACRO file, it must contain the following two lines of code at the beginning (replace the name with your robot's name):

In [ ]:
```
<?xml version="1.0"?>
<robot xmlns:xacro="http://www.ros.org/wiki/xacro" name="my_box_bot">
```

And close the `robot` element at the very bottom:

In [ ]:
```
</robot>
```

As you can see, this is not much different from what a minimal URDF file must contain. The only difference is that XACRO files must have an xmlns:xacro attribute in the robot tag.

Over the next few exercises, you will create an XACRO version of your beloved box_bot robot. To create your 'new' robot model, you move into the **my_box_bot_description** package and inside the **URDF** folder to create a new empty file named **box_bot.xacro**.

▶ Execute in Webshell 1

In [ ]:
```
cd ~/ros2_ws/src/my_box_bot_description/urdf
```

In [ ]:
```
touch box_bot.xacro
```

The `urdf.xacro` and the simpler `.xacro` file extensions are generally used for files written using XACRO.

Currently, the robot only consists of a squared box with no sensors or control. You can use the code presented below to define the robot's main body:

In [ ]:
```
<!-- Body -->
  <link name="chassis">
    <visual>
      <geometry>
        <box size="0.1 0.1 0.1"/>
      </geometry>
    </visual>

    <collision>
      <geometry>
        <box size="0.1 0.1 0.1"/>
      </geometry>
    </collision>

    <inertial>
      <mass value="0.5"/>
      <origin rpy="0 0 0" xyz="0 0 0"/>
      <inertia ixx="0.0008333333333333335" ixy="0" ixz="0" iyy="0.0008333333333333335" iyz="0" izz="0.0008333333333333335"/>
    </inertial>

  </link>
```

- End of Exercise 7.1.1 -

- Solution to Exercise 7.1.1 -

box_bot.xacro

In [ ]:

```
<?xml version="1.0"?>
<robot xmlns:xacro="http://www.ros.org/wiki/xacro" name="my_box_bot">

<link name="base_link">
  </link>

  <joint name="base_link_joint" type="fixed">
    <origin rpy="0 0 0" xyz="0 0 0" />
    <parent link="base_link" />
    <child link="chassis" />
  </joint>

  <link name="chassis">
    <visual>
      <geometry>
        <box size="0.1 0.1 0.1"/>
      </geometry>
    </visual>

    <collision>
      <geometry>
        <box size="0.1 0.1 0.1"/>
      </geometry>
    </collision>

    <inertial>
      <mass value="0.5"/>
      <origin rpy="0 0 0" xyz="0 0 0"/>
      <inertia ixx="0.0008333333333333335" ixy="0" ixz="0" iyy="0.0008333333333333335" iyz="0" izz="0.0008333333333333335"/>
    </inertial>

  </link>

</robot>
```

- End of Solution to Exercise 7.1.1 -

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