```
<?xml version='1.0'?>
<sdf version='1.4'>
    <model name="atom">
        <static>false</static>

        <!-- Make Chassis of Bot -->
        <link name="chassis">
            <pose>0 0 0.2 0 0 0</pose>
            <inertial>
                <mass>15.0</mass>
                <inertia> <!-- inertias are tricky to compute -->
                    <!-- http://gazebosim.org/tutorials?tut=inertia&cat=build_robot
-->
                    <ixx>1.535</ixx>       <!-- for a box: ixx = 0.083 * mass *
(y*y + z*z) -->
                    <ixy>0.0</ixy>         <!-- for a box: ixy = 0 -->
                    <ixz>0.0</ixz>         <!-- for a box: ixz = 0 -->
                    <iyy>1.535</iyy>       <!-- for a box: iyy = 0.083 * mass *
(x*x + z*z) -->
                    <iyz>0.0</iyz>         <!-- for a box: iyz = 0 -->
                    <izz>1.745</izz>       <!-- for a box: izz = 0.083 * mass *
(x*x + y*y) -->
                </inertia>
            </inertial>
            <collision name="collision">
                <geometry>
                    <box>
                        <size> 1 0.5 0.2 </size>
                    </box>
                </geometry>
            </collision>

            <visual name="visual">
                <geometry>
                    <box>
                        <size> 1 0.5 0.2 </size>
                    </box>
                </geometry>

                <material>
                    <script>
,
<uri>model://atom/materials/scripts/repeated.material</uri>
,                       <name>Atom</name>
,                    </script>
                </material>

            </visual>

        </link>

        <!-- Right Wheel Back -->
        <link name="right_wheel_back">
            <pose> -0.2 0.3 0.1 0 1.5707 1.5707</pose>
            <inertial>
                <mass>5.0</mass>
                <inertia> <!-- inertias are tricky to compute -->
                    <!-- http://gazebosim.org/tutorials?tut=inertia&cat=build_robot
-->
                    <ixx>0.1</ixx>
                    <ixy>0.0</ixy>
                    <ixz>0.0</ixz>
```

```
                    <iyy>0.1</iyy>
                    <iyz>0.0</iyz>
                    <izz>0.1</izz>
                </inertia>
            </inertial>
            <visual name="visual">
                <geometry>
                    <cylinder>
                        <radius> 0.1 </radius>
                        <length>0.05</length>
                    </cylinder>
                </geometry>
                <material> <!-- Wheel material -->
                    <ambient>0.1 0.1 0.1 1</ambient>
                    <diffuse>0.1 0.1 0.2 1</diffuse>
                    <specular>0 0 0 0</specular>
                    <emissive>0 0 0 1</emissive>
                </material> <!-- End wheel material -->
            </visual>
            <collision name="collision">
                <geometry>
                    <cylinder>
                        <radius> 0.1 </radius>
                        <length>0.05</length>
                    </cylinder>
                </geometry>
            </collision>

        </link>

        <!-- Right Wheel Front -->
        <link name="right_wheel_front">
            <pose> 0.2 0.3 0.1 0 1.5707 1.5707</pose>
            <inertial>
                <mass>5.0</mass>
                <inertia> <!-- inertias are tricky to compute -->
                    <!-- http://gazebosim.org/tutorials?tut=inertia&cat=build_robot
-->
                    <ixx>0.1</ixx>
                    <ixy>0.0</ixy>
                    <ixz>0.0</ixz>
                    <iyy>0.1</iyy>
                    <iyz>0.0</iyz>
                    <izz>0.1</izz>
                </inertia>
            </inertial>
            <visual name="visual">
                <geometry>
                    <cylinder>
                        <radius> 0.1 </radius>
                        <length>0.05</length>
                    </cylinder>
                </geometry>
                <material> <!-- Wheel material -->
                    <ambient>0.1 0.1 0.1 1</ambient>
                    <diffuse>0.1 0.1 0.2 1</diffuse>
                    <specular>0 0 0 0</specular>
                    <emissive>0 0 0 1</emissive>
                </material> <!-- End wheel material -->
            </visual>
            <collision name="collision">
```

```
                <geometry>
                    <cylinder>
                        <radius> 0.1 </radius>
                        <length>0.05</length>
                    </cylinder>
                </geometry>
            </collision>
        </link>

        <!-- Left Wheel Back -->
        <link name="left_wheel_back">
            <pose> -0.2 -0.3 0.1 0 1.5707 1.5707</pose>
            <inertial>
                <mass>5.0</mass>
                <inertia> <!-- inertias are tricky to compute -->
                    <!-- http://gazebosim.org/tutorials?tut=inertia&cat=build_robot
-->
                    <ixx>0.1</ixx>
                    <ixy>0.0</ixy>
                    <ixz>0.0</ixz>
                    <iyy>0.1</iyy>
                    <iyz>0.0</iyz>
                    <izz>0.1</izz>
                </inertia>
            </inertial>
            <visual name="visual">
                <geometry>
                    <cylinder>
                        <radius> 0.1 </radius>
                        <length>0.05</length>
                    </cylinder>
                </geometry>
                <material> <!-- Wheel material -->
                    <ambient>0.1 0.1 0.1 1</ambient>
                    <diffuse>0.1 0.1 0.2 1</diffuse>
                    <specular>0 0 0 0</specular>
                    <emissive>0 0 0 1</emissive>
                </material> <!-- End wheel material -->
            </visual>
            <collision name="collision">
                <geometry>
                    <cylinder>
                        <radius> 0.1 </radius>
                        <length>0.05</length>
                    </cylinder>
                </geometry>
            </collision>
        </link>

        <!-- Left Wheel Front -->
        <link name="left_wheel_front">
            <pose> 0.2 -0.3 0.1 0 1.5707 1.5707</pose>
            <inertial>
                <mass>5.0</mass>
                <inertia> <!-- inertias are tricky to compute -->
                    <!-- http://gazebosim.org/tutorials?tut=inertia&cat=build_robot
-->
                    <ixx>0.1</ixx>
                    <ixy>0.0</ixy>
                    <ixz>0.0</ixz>
                    <iyy>0.1</iyy>
                    <iyz>0.0</iyz>
```

```
                    <izz>0.1</izz>
                </inertia>
            </inertial>
            <visual name="visual">
                <geometry>
                    <cylinder>
                        <radius> 0.1 </radius>
                        <length>0.05</length>
                    </cylinder>
                </geometry>
                <material> <!-- Wheel material -->
                    <ambient>0.1 0.1 0.1 1</ambient>
                    <diffuse>0.1 0.1 0.2 1</diffuse>
                    <specular>0 0 0 0</specular>
                    <emissive>0 0 0 1</emissive>
                </material> <!-- End wheel material -->
            </visual>
            <collision name="collision">
                <geometry>
                    <cylinder>
                        <radius> 0.1 </radius>
                        <length>0.05</length>
                    </cylinder>
                </geometry>
            </collision>
        </link>

        <!-- Define Joints -->
        <!-- Right Wheel Joint Back-->
        <joint type="revolute" name="right_wheel_hinge_back">
            <pose>0 0 0.03 0 0 0</pose>
            <child>right_wheel_back</child>
            <parent>chassis</parent>
            <axis>
                <xyz>0 1 0</xyz>
            </axis>
        </joint>

        <!-- Right Wheel Joint Front-->
        <joint type="revolute" name="right_wheel_hinge_front">
            <pose>0 0 0.03 0 0 0</pose>
            <child>right_wheel_front</child>
            <parent>chassis</parent>
            <axis>
                <xyz>0 1 0</xyz>
            </axis>
        </joint>

        <!-- Left Wheel Joint Back-->
        <joint type="revolute" name="left_wheel_hinge_back">
            <pose>0 0 -0.03 0 0 0</pose>
            <child>left_wheel_back</child>
            <parent>chassis</parent>
            <axis>
                <xyz>0 1 0</xyz>
            </axis>
        </joint>

        <!-- Left Wheel Joint front-->
        <joint type="revolute" name="left_wheel_hinge_front">
            <pose>0 0 -0.03 0 0 0</pose>
```

```
238             <child>left_wheel_front</child>
239             <parent>chassis</parent>
240             <axis>
241                 <xyz>0 1 0</xyz>
242             </axis>
243         </joint>
244 
245         <!-- Camera -->
246         <link name="camera_link">
247             <pose>0.26 0 2 0 0 0</pose>
248 
249             <visual name="visual">
250                 <geometry>
251                     <box>
252                         <size>0.05 0.05 0.05</size>
253                     </box>
254                 </geometry>
255             </visual>
256 
257             <collision name="collision">
258                 <geometry>
259                     <box>
260                         <size>0.05 0.05 0.05</size>
261                     </box>
262                 </geometry>
263             </collision>
264 
265             <sensor type="camera" name="camera1">
266                 <update_rate>30.0</update_rate>
267                 <camera name="head">
268                     <horizontal_fov>1.3962634</horizontal_fov>
269                     <image>
270                         <width>800</width>
271                         <height>800</height>
272                         <format>R8G8B8</format>
273                     </image>
274                     <clip>
275                         <near>0.02</near>
276                         <far>300</far>
277                     </clip>
278                 </camera>
279                 <always_on>1</always_on>
280                 <visualize>1</visualize>
281                 <plugin name="camera_controller"
filename="libgazebo_ros_camera.so">
282                     <alwaysOn>true</alwaysOn>
283                     <updateRate>0.0</updateRate>
284                     <cameraName>atom/camera</cameraName>
285                     <imageTopicName>rgb/image_raw</imageTopicName>
286                     <cameraInfoTopicName>rgb/camera_info</cameraInfoTopicName>
287                     <frameName>camera_link</frameName>
288                     <hackBaseline>0.07</hackBaseline>
289                     <distortionK1>0.0</distortionK1>
290                     <distortionK2>0.0</distortionK2>
291                     <distortionK3>0.0</distortionK3>
292                     <distortionT1>0.0</distortionT1>
293                     <distortionT2>0.0</distortionT2>
294                     <publishTF>true</publishTF>
295                 </plugin>
296             </sensor>
297         </link>
```

```
298
299         <!-- Camera Joint -->
300         <joint type="fixed" name="camera_joint" >
301             <!--<pose>0.26 0 0.15 0 0 0</pose> -->
302             <parent>chassis</parent>
303             <child>camera_link</child>
304             <axis>
305                 <xyz>0 1 0</xyz>
306             </axis>
307         </joint>
308
309         <!-- Project center to the ground -->
310         <link name="robot_footprint"></link>
311
312         <!-- Plugin -->
313         <plugin name="skid_steer_drive_controller"
filename="libgazebo_ros_skid_steer_drive.so">
314             <updateRate>100.0</updateRate>
315             <robotNamespace>/</robotNamespace>
316             <leftFrontJoint>left_wheel_hinge_front</leftFrontJoint>
317             <rightFrontJoint>right_wheel_hinge_front</rightFrontJoint>
318             <leftRearJoint>left_wheel_hinge_back</leftRearJoint>
319             <rightRearJoint>right_wheel_hinge_back</rightRearJoint>
320             <wheelSeparation>0.4</wheelSeparation>
321             <wheelDiameter>0.2</wheelDiameter>
322             <robotBaseFrame>robot_footprint</robotBaseFrame>
323             <torque>10</torque>
324             <topicName>cmd_vel</topicName>
325             <odometryTopic>odom</odometryTopic>
326             <odometryFrame>odom</odometryFrame>
327             <commandTopic>cmd_vel</commandTopic>
328             <topic_name_twist>cmd_vel</topic_name_twist>
329             <topic_name_odometry>odom</topic_name_odometry>
330             <topic_name_joint>joint</topic_name_joint>
331             <broadcastTF>true</broadcastTF>
332             <covariance_x>0.0001</covariance_x>
333             <covariance_y>0.0001</covariance_y>
334             <covariance_yaw>0.01</covariance_yaw>
335
336         </plugin>
337
338         <!-- LiDAR -->
339         <link name="hokuyo">
340             <pose>0.24 0 0.33 0 0 0</pose>
341             <inertial>
342                 <mass>1e-5</mass>
343                 <inertia> <!-- inertias are tricky to compute -->
344                     <!-- http://gazebosim.org/tutorials?tut=inertia&cat=build_robot
-->
345                     <ixx>1e-6</ixx>
346                     <ixy>0.0</ixy>
347                     <ixz>0.0</ixz>
348                     <iyy>1e-6</iyy>
349                     <iyz>0.0</iyz>
350                     <izz>1e-6</izz>
351                 </inertia>
352             </inertial>
353
354             <visual name="visual">
355                 <geometry>
356                     <mesh>
357                         <uri> model://atom/meshes/hokuyo.dae</uri>
```

```
                </mesh>
            </geometry>
        </visual>

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

        <sensor type="ray" name="head_hokuyo_sensor">
            <pose>0 0 0 0 0 0</pose>
            <visualize>false</visualize>
            <update_rate>40</update_rate>
            <ray>
                <scan>
                    <horizontal>
                        <samples>720</samples>
                        <resolution>1</resolution>
                        <min_angle>-1.570796</min_angle>
                        <max_angle>1.570796</max_angle>
                    </horizontal>
                </scan>

                <range>
                    <min>0.10</min>
                    <max>30.0</max>
                    <resolution>0.01</resolution>
                </range>

                <noise>
                    <type>gaussian</type>
                    <!-- Noise parameters based on published spec for Hokuyo laser
                         achieving "+-30mm" accuracy at range < 10m.  A mean of 0.0m and
                         stddev of 0.01m will put 99.7% of samples within 0.03m of the true
                         reading. -->
                    <mean>0.0</mean>
                    <stddev>0.01</stddev>
                </noise>

            </ray>
            <plugin name="gazebo_ros_head_hokuyo_controller" filename="libgazebo_ros_laser.so">
                <topicName>/scan</topicName>
                <frameName>hokuyo</frameName>
            </plugin>
        </sensor>
    </link>

    <joint name="hokuyo_joint" type="fixed">
        <pose></pose>
        <parent>chassis</parent>
        <child>hokuyo</child>
        <axis>
            <xyz>0 1 0</xyz>
        </axis>
    </joint>
```

```
416
417     </model>
418 </sdf>
```