Solutions for Unit 2 Mapping

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Solution Exercise 2.5

Exercise 2.5

For this exercise, we will assume that our map file is called **my_map.yaml**, and that it is placed into the **catkin_ws/src** directory.

Launch File: move_robot.launch

In [ ]:
```
<launch>
    <arg name="map_file" default="/home/user/catkin_ws/src/my_map.yaml"/>
    <node name="map_server" pkg="map_server" type="map_server" args="$(arg map_file)" />
</launch>
```

END Launch File: move_robot.launch

Solution Exercise 2.7

Exercise 2.7

Create a Service Client that calls to the service **/static_map**.

Launch File: call_map_service.launch

In [ ]:
```
<launch>
    <node pkg="get_map_data" type="call_map_service.py" name="service_client" output="screen" />
</launch>
```

END Launch File: call_map_service.launch

Python File: call_map_service.py

In [ ]:
```
#! /usr/bin/env python

import rospy
from nav_msgs.srv import GetMap, GetMapRequest
import sys

rospy.init_node('service_client') # Initialise a ROS node with the name service_client
rospy.wait_for_service('/static_map') # Wait for the service /static_map to be running
get_map_service = rospy.ServiceProxy('/static_map', GetMap) # Create the connection to the service
get_map = GetMapRequest() # Create an object of type GetMapRequest
result = get_map_service(get_map) # Call the service
print result # Print the result given by the service called
```

END Python File: call_map_service.py

Solution Exercise 2.10

Exercise 2.10

Create a package and a launch file in order to launch a static_transform_publisher node. This node should publish the transform between the Kinect camera mounted on the robot and the base link of the robot.

Launch File: pub_static_tf.launch

In [ ]:
```
<launch>
    <node pkg="tf" type="static_transform_publisher" name="static_tf_node"
          args="1 0 0 0 0 0 base_link kinect_link 30">
    </node>
</launch>
```

END Launch File: pub_static_tf.launch

Solution Exercise 2.11

Exercise 2.11

Launch File: my_gmapping_launch.launch

In [ ]:
```
<launch>
  <arg name="scan_topic"  default="kobuki/laser/scan" />
  <arg name="base_frame"  default="base_footprint"/>
  <arg name="odom_frame"  default="odom"/>

  <node pkg="gmapping" type="slam_gmapping" name="slam_gmapping" output="screen">
    <param name="base_frame" value="$(arg base_frame)"/>
    <param name="odom_frame" value="$(arg odom_frame)"/>
    <param name="map_update_interval" value="15.0"/>
    <param name="maxUrange" value="6.0"/>
    <param name="maxRange" value="8.0"/>
    <param name="sigma" value="0.05"/>
    <param name="kernelSize" value="1"/>
    <param name="lstep" value="0.05"/>
    <param name="astep" value="0.05"/>
    <param name="iterations" value="5"/>
    <param name="lsigma" value="0.075"/>
```

```
    <param name="ogain" value="3.0"/>
    <param name="lskip" value="0"/>
    <param name="minimumScore" value="200"/>
    <param name="srr" value="0.01"/>
    <param name="srt" value="0.02"/>
    <param name="str" value="0.01"/>
    <param name="stt" value="0.02"/>
    <param name="linearUpdate" value="0.5"/>
    <param name="angularUpdate" value="0.436"/>
    <param name="temporalUpdate" value="-1.0"/>
    <param name="resampleThreshold" value="0.5"/>
    <param name="particles" value="80"/>
  <!--
    <param name="xmin" value="-50.0"/>
    <param name="ymin" value="-50.0"/>
    <param name="xmax" value="50.0"/>
    <param name="ymax" value="50.0"/>
  make the starting size small for the benefit of the Android client's memory...
  -->
    <param name="xmin" value="-1.0"/>
    <param name="ymin" value="-1.0"/>
    <param name="xmax" value="1.0"/>
    <param name="ymax" value="1.0"/>

    <param name="delta" value="0.05"/>
    <param name="llsamplerange" value="0.01"/>
    <param name="llsamplestep" value="0.01"/>
    <param name="lasamplerange" value="0.005"/>
    <param name="lasamplestep" value="0.005"/>
    <remap from="scan" to="$(arg scan_topic)"/>
  </node>
</launch>
```

END Launch File: my_gmapping_launch.launch

Solution Exercise 2.12

Exercise 2.12

Launch File: my_gmapping_launch.launch

In [ ]:
```
<launch>
  <arg name="scan_topic"  default="kobuki/laser/scan" />
  <arg name="base_frame"  default="base_footprint"/>
  <arg name="odom_frame"  default="odom"/>

  <node pkg="gmapping" type="slam_gmapping" name="slam_gmapping" output="screen">
    <param name="base_frame" value="$(arg base_frame)"/>
    <param name="odom_frame" value="$(arg odom_frame)"/>
    <param name="map_update_interval" value="5.0"/>
    <param name="maxUrange" value="2.0"/>
    <param name="maxRange" value="8.0"/>
    <param name="sigma" value="0.05"/>
    <param name="kernelSize" value="1"/>
    <param name="lstep" value="0.05"/>
    <param name="astep" value="0.05"/>
    <param name="iterations" value="5"/>
    <param name="lsigma" value="0.075"/>
    <param name="ogain" value="3.0"/>
    <param name="lskip" value="0"/>
    <param name="minimumScore" value="200"/>
    <param name="srr" value="0.01"/>
    <param name="srt" value="0.02"/>
    <param name="str" value="0.01"/>
    <param name="stt" value="0.02"/>
    <param name="linearUpdate" value="0.5"/>
    <param name="angularUpdate" value="0.436"/>
    <param name="temporalUpdate" value="-1.0"/>
    <param name="resampleThreshold" value="0.5"/>
```

```
    <param name="particles" value="80"/>
  <!--
    <param name="xmin" value="-50.0"/>
    <param name="ymin" value="-50.0"/>
    <param name="xmax" value="50.0"/>
    <param name="ymax" value="50.0"/>
  make the starting size small for the benefit of the Android client's memory...
  -->
    <param name="xmin" value="-1.0"/>
    <param name="ymin" value="-1.0"/>
    <param name="xmax" value="1.0"/>
    <param name="ymax" value="1.0"/>

    <param name="delta" value="0.05"/>
    <param name="llsamplerange" value="0.01"/>
    <param name="llsamplestep" value="0.01"/>
    <param name="lasamplerange" value="0.005"/>
    <param name="lasamplestep" value="0.005"/>
    <remap from="scan" to="$(arg scan_topic)"/>
  </node>
</launch>
```

END Launch File: my_gmapping_launch.launch

Solution Exercise 2.13

Exercise 2.13

Launch File: my_gmapping_launch.launch

In [ ]:
```
<launch>
```

```
<arg name="scan_topic"  default="kobuki/laser/scan" />
<arg name="base_frame"  default="base_footprint"/>
<arg name="odom_frame"  default="odom"/>

<node pkg="gmapping" type="slam_gmapping" name="slam_gmapping" output="screen">
  <param name="base_frame" value="$(arg base_frame)"/>
  <param name="odom_frame" value="$(arg odom_frame)"/>
  <param name="map_update_interval" value="5.0"/>
  <param name="maxUrange" value="6.0"/>
  <param name="maxRange" value="8.0"/>
  <param name="sigma" value="0.05"/>
  <param name="kernelSize" value="1"/>
  <param name="lstep" value="0.05"/>
  <param name="astep" value="0.05"/>
  <param name="iterations" value="5"/>
  <param name="lsigma" value="0.075"/>
  <param name="ogain" value="3.0"/>
  <param name="lskip" value="0"/>
  <param name="minimumScore" value="200"/>
  <param name="srr" value="0.01"/>
  <param name="srt" value="0.02"/>
  <param name="str" value="0.01"/>
  <param name="stt" value="0.02"/>
  <param name="linearUpdate" value="0.5"/>
  <param name="angularUpdate" value="0.436"/>
  <param name="temporalUpdate" value="-1.0"/>
  <param name="resampleThreshold" value="0.5"/>
  <param name="particles" value="80"/>
<!--
  <param name="xmin" value="-50.0"/>
  <param name="ymin" value="-50.0"/>
  <param name="xmax" value="50.0"/>
  <param name="ymax" value="50.0"/>
make the starting size small for the benefit of the Android client's memory...
-->
  <param name="xmin" value="-100.0"/>
  <param name="ymin" value="-100.0"/>
  <param name="xmax" value="100.0"/>
```

```
    <param name="xmax" value="100.0" />
    <param name="ymax" value="100.0"/>

    <param name="delta" value="0.05"/>
    <param name="llsamplerange" value="0.01"/>
    <param name="llsamplestep" value="0.01"/>
    <param name="lasamplerange" value="0.005"/>
    <param name="lasamplestep" value="0.005"/>
    <remap from="scan" to="$(arg scan_topic)"/>
  </node>
</launch>
```

END Launch File: my_gmapping_launch.launch

Solution Exercise 2.15

Exercise 2.15

Launch File: my_gmapping_launch.launch

In [ ]:
```
<launch>
     <arg name="scan_topic" default="/kobuki/laser/scan" />

   <!-- Defining parameters for slam_gmapping node -->

     <node pkg="gmapping" type="slam_gmapping" name="slam_gmapping"
     output="screen">

       <rosparam file="$(find my_mapping_launcher)/params/gmapping_params.yaml" command="load" />

       <remap from="scan" to="$(arg scan_topic)"/>

     </node>

</launch>
```

END Launch File: my_gmapping_launch.launch

Params File: gmapping_params.yaml

In [ ]:
```
base_frame: base_footprint
odom_frame: odom
map_update_interval: 5.0
maxUrange: 6.0
maxRange: 8.0

minimumScore: 200

linearUpdate: 0.5
angularUpdate: 0.436
temporalUpdate: -1.0
resampleThreshold: 0.5
particles: 80
xmin: -1.0
ymin: -1.0
xmax: 1.0
ymax: 1.0

delta: 0.05
llsamplerange: 0.01
llsamplestep: 0.01
lasamplerange: 0.005
lasamplestep: 0.005
```

END Params File: gmapping_params.yaml