HRW ROS Assignment 1 Week 3 Part 1

In this first part we will prepare for navigation in our factory world.

1. Launch the turtlebot on the `hrwros_factory` simulation with:

   ```
   $ roslaunch hrwros_week3 hrwros_turtlebot_navigation.launch
   ```

   Note that the factory environment has quite a lot of graphics to be rendered on Gazebo and depending on the processing power on your computer, it might take some time before you can see everything like it is shown in the picture above. Also the Turtlebot does not show-up immediately, it is timed out to appear after 7 seconds.

   In some cases, also depending on your computer, the launch may fail or an error on the gazebo server may appear. In that case, just close and restart all the CCS you have open.

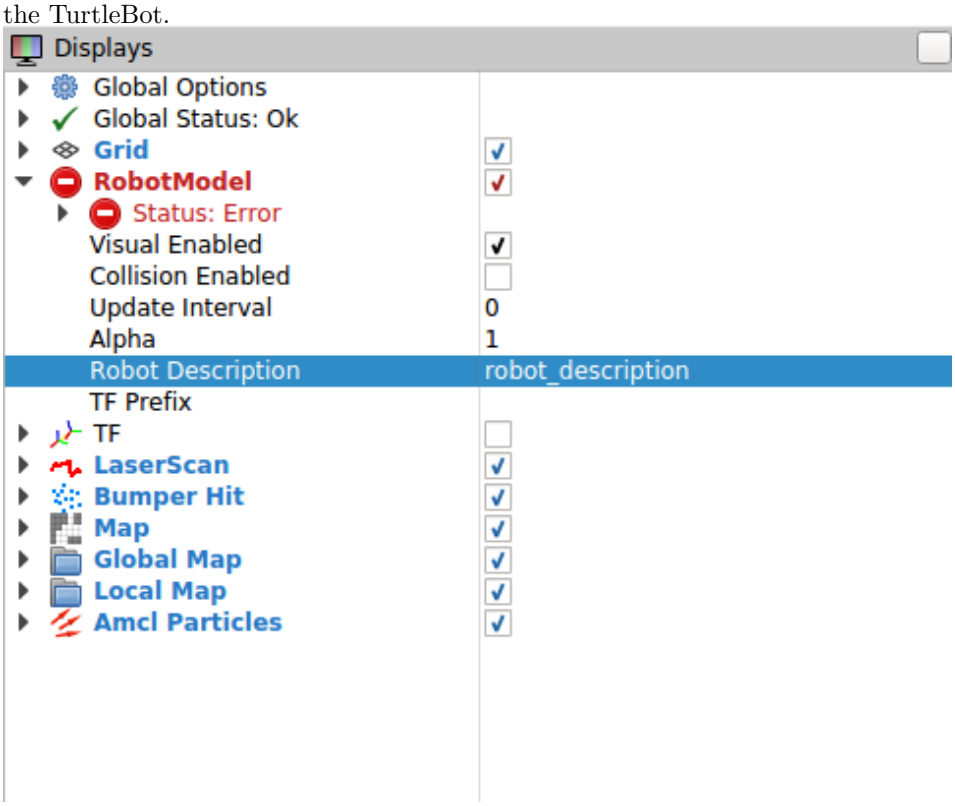
2. Launch AMCL with a map of the factory we have created for you:

   ```
   $ roslaunch turtlebot_gazebo amcl_demo.launch
       map_file:=$HOME/hrwros_ws/src/hrwros_week3/config/map_factory_v1.yaml
   ```

3. Next, start the RViz navigation visualization:

   ```
   $ roslaunch hrwros_week3 hrwros_view_navigation.launch
   ```

In RViz, you will see there are now a few red marks in the display tab to the left. Let's fix these errors first! They appeared in red because RViz is missing the robot description parameter. This was to be expected, because there are actually three robots present in the factory! So let's tell RViz which one is the TurtleBot.



Change `robot_description` to `turtlebot_description`. You can do this in RViz directly!
The assignment then is:
Deliver a screenshot of the RViz screen, showing a green cloud of arrows where AMCL thinks the TurtleBot is. This position estimation clearly is incorrect! However, we will solve that in part 2 of this assignment.
For this screenshot, the position doesn't have to be correct. Keep both Gazebo and RViz simulations running as you move on to the next part.

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HRW ROS Assignment 1 Week 3 Part 2

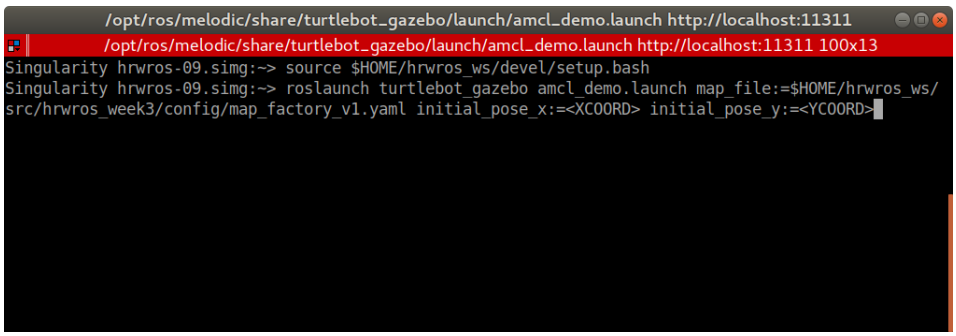
At the end of the first part, we noted that the pose of the TurtleBot in RViz is currently incorrect, because we can see it is further away in Gazebo than in RViz. With the labeled map we have above, it looks like it is in front of the conveyor belt. This is because when we launch AMCL, it will assume a default initial pose at the origin, but the TurtleBot is actually spawned in a different position in Gazebo.
Because the TurtleBot can't see many objects in front of it, it has no point of reference. Thus, the localization can't correct the pose estimation from the default initial pose. We can fix this when launching AMCL by telling it where we know the TurtleBot is on Gazebo. We can do this by passing the `initial_pose_x` and `initial_pose_y` arguments to the `amcl_demo.launch`.
The assignment is as follows:

1. In the Hands-on practice 1 of the Recap module of this Week, you learned how to find the pose of the TurtleBot in Gazebo from the World tab.

2. Use the relevant coordinates from that pose to tell AMCL where the initial pose is, like in the terminal screenshot below.

   You need to terminate the `amcl_demo.launch` launched previously (if it was still running) and relaunch it as follows:

   ```
   $ roslaunch turtlebot_gazebo amcl_demo.launch
       map_file:=$HOME/hrwros_ws/src/hrwros_week3/config/map_factory_v1.yaml
       initial_pose_x:=<XCOORD> initial_pose_y:=<YCOORD>
   ```

3. Upload an RViz screenshot with the 'green arrow cloud' and the TurtleBot shifted to the correct location. This screenshot should correspond more or less to where the TurtleBot has been spawned in Gazebo (imagine that the map is overlaid on to Gazebo).

Keep both Gazebo and RViz simulations running as you move on to the next part.

HRW ROS Assignment 1 Week 3 Part 3

Now that everything is fixed, that is, RViz knows the robot description, and AMCL also has a good estimation of the initial position of the TurtleBot, let's take it for a spin!
We will use the teleoperation for this, open another CCS and launch the teleoperation (as we did on the first part of this week)
`$ roslaunch turtlebot_teleop keyboard_teleop.launch`
Move the turtlebot around. You should see that, as the robot moves, the cloud of green arrows around it becomes less disperse and more dense centered in the robot. This means that the AMCL is improving the robot's estimation of its position.
The assignment is:

1. Deliver a screenshot of RViz with the TurtleBot in a different position in the factory. Make sure the 'green cloud of arrows' is in view, and that it has converged to a better estimation.

This completes Assignment 1. Keep the Gazebo and RViz simulations, and the amcl launch running.

This completes HRW ROS Assignment 1 Week 3