Robot Practical Course Bachelor
Assignment #3

This assignment introduces ROS' navigation software stack. You will create a map of the TAMS floor using Simultaneous Localization and Mapping (SLAM) techniques, and use this map for autonomous navigation. You should use this map throughout the rest of this course.

Task 3.1 Build a map: Autonomous navigation in an environment requires a map. This is used to estimate the current pose of the robot and to plan paths to desired goals.

3.1.1: Create your own map of the TAMS floor using the Simultaneous Localization and Mapping (SLAM) algorithm `gmapping` available in ROS. Include the lab F-326, and the hallway up to the fire door in front of the kitchen. This tutorial provides a rough guideline:

`http://wiki.ros.org/turtlebot_navigation/Tutorials/kinetic/`
`BuildamapwithSLAM`

Instead of `gmapping_demo.launch`, you should use the launch file `gmapping.launch` in the package `tams_turtlebot_navigation`.

Hint: Open the doors in the environment completely to facilitate localization.

Hint: To move the robot around, you can use manual teleoperation and/or submit 2D-Nav-Goals via Rviz. Autonomous navigation results in smoother movements.

3.1.2: Once you created a map of the environment, make sure to save it before killing the gmapper-node! The saved map consists of an image and a yaml file. The map should represent the usual state of the environment and should not include dynamic obstacles such as humans or other turtlebots. Use an image editor (e.g. gimp) to clear such obstacles from your map.

Task 3.2 Bringup navigation with your map:

3.2.1: To make use of your map for autonomous navigation, save both files in a `map` folder in your ROS package.

3.2.2: Create an additional folder `launch` in your package and write a launch file that brings up the turtlebot drivers (`tams_turtlebot.launch` in the package `tams_turtlebot_bringup` does that) and the navigation system with your map (use `navigation.launch` in the package `tams_turtlebot_navigation`).

3.2.3: Launch the launch-file you created and verify that you can move the robot around with 2D-Nav-Goals via Rviz.

Task 3.3 Use the navigation: Now that everything is in place, make use of the navigation capability.

3.3.1: Write a node that invokes the `move_base` action of the move_base node and moves your turtlebot alternating between two fixed positions on your map.

Look into the "Simple Action Client" tutorials of the actionlib to understand how to invoke an action.

`http://wiki.ros.org/actionlib_tutorials/Tutorials`