ROS - Modifying Your Map
ME 4140 - Introduction to Robotics - Fall 2017

This tutorial will guide you through the process of making your own map from the default map and modifying it for your own purposes. For more information read the wiki.

1. Navigate to the install directory using *cd*.

   ```
   $ cd /opt/ros/kinetic/share/turtlebot_stage/maps/
   ```

2. Make a directory to put your maps in using *mkdir*.

   ```
   $ mkdir ~/<workspace_name>/src/<package_name>/maps
   ```

3. Copy 3 files into the directory you just made using *cp*. This is the directory that you want to keep them in.(*not* with sudo).

   ```
   $ cp maze.yaml ~/<workspace_name>/src/<package_name>/maps/new_maze.yaml
   $ cp maze.png ~/<workspace_name>/src/<package_name>/maps/new_maze.png
   $ cd stage
   $ cp maze.world ~/<workspace_name>/src/<package_name>/maps/new_maze.world
   ```

4. Make two edits to the new_maze.world file.
   ```
   $ gedit ~/<workspace_name>/src/<package_name>/maps/new_maze.world
   ```
   change: `include "turtlebot.inc"`
   to:
   ```
   include "/opt/ros/kinetic/share/turtlebot_stage/maps/stage/turtlebot.inc"
   ```

   change: `name "maze" bitmap "../maze.png"`
   to:
   ```
   name "new_maze" bitmap "new_maze.png"
   ```

5. Make one edit to the new_maze.yaml file
   ```
   $ gedit ~/<workspace_name>/src/<package_name>/maps/new_maze.yaml
   ```
   change: `image:  maze.png`
   to: `image:  new_maze.png`

6. Edit your image file new_maze.png with the image editor of your choice.
   ```
   $ sudo apt-get install pinta
   $ pinta ~/<workspace_name>/src/<package_name>/maps/new_maze.png
   ```

7. Set your map as an environment variable and run the simulator
   ```
   $ export TURTLEBOT_STAGE_MAP_FILE=
   "/home/<user_name>/<workspace_name>/src/<package_name>/maps/new_maze.yaml"
   $ export TURTLEBOT_STAGE_WORLD_FILE=
   "/home/<user_name>/<workspace_name>/src/<package_name>/maps/new_maze.world"
   ```

8. Launch a robot in a newly modified map !
   ```
   $ roslaunch turtlebot_stage turtlebot_in_stage.launch
   ```

9. Now we want to use a map with a different size and resolution. To do this we need to make a few small changes.

   (a) Set the name of the map in the .world file. If the map image is in a different directory include the entire path. Also, Set the map size and center in meters here.

   ```
   floorplan
   (
     name "brown_3rd"
     bitmap "brown_3rd.png"
     size [ 59.0 22.0 2.0 ]        #size of the map file in meters
     pose [ 29.5 11.0 0.0 0.0 ]    #center of the map file in meters\\
   )
   ```

   (b) Set the initial pose of the robot in the .world file.

   ```
   turtlebot
   (
     pose [ 5.0 9.0 0.0 0.0 ] #initial robot pose in meters
     name "turtlebot"
     color "black"
   )
   ```

   (c) Set the map name in the .yaml file. Also, set the resolution in meters per pixel.

   ```
   image: brown_3rd.png
   resolution: 0.07 # map resolution in meters/pixel
   origin: [0.0, 0.0, 0.0]
   negate: 0
   occupied_thresh: 0.65
   free_thresh: 0.196
   ```

   (d) Export the correct files. Also, you could put the export lines in your .bashrc file so you dont have to do the exports everytime.

   (e) Turn on the simulator. Notice you also have to declare the initial pose here too. This could be fixed with a launch file which is covered in the next lesson.

   ```
   $ roslaunch turtlebot_stage turtlebot_in_stage.launch initial_pose_x=5.0
   initial_pose_y=9.0 initial_pose_a=0.0
   ```

   If that line causes an error try this one instead (I am working on this bug!)

   ```
   $ roslaunch turtlebot_stage turtlebot_in_stage.launch initial_pose_x:=5.0
   initial_pose_y:=9.0
   ```