Simulation with ROS and Gazebo laboratory

During this laboratory you will use ROS and Gazebo to control a simulated Husky Unmanned Ground Vehicle through a building. You will also have to modify the robot to add several sensors to it.

During the laboratory you must create a report which documents your progress.

The report should include the issued commands, modified configurations and screenshots from the results. **Please bold the changes you made to the configuration.** Basically the report should include everything to make the tasks and their results easily reproducible.

This document assumes you read the laboratory's detailed documentation.

1. Introduction to ROS and Gazebo

This task makes you familiar with ROS and Gazebo.
a) Using the terminal change to the `~/catkin_ws` folder and compile it, then use the `source` command to activate the generated workspace.
b) Using `roslaunch` run the `husky_custom_gazebo` package's `start.launch` file, this will start the ROS and Gazebo simulated environment, with the Husky robot and the building.
c) Run the `teleop_twist_keyboard` package to control the robot.
d) List the running nodes and topics using the `rosnode` and `rostopic` commands, and choose some of them and describe what they do.
e) Use rqt's node graph to visualize the running environment and explain how does the `teleop_twist_keyboard` sends commands to the robot.
f) Use RVIZ to visualize the robot model and add interactive markers which control the robot. You will have to change the Fixed Frame setting of RVIZ to make it work. Find out what the root of the link tree is, using rqt's tf tree visualizer.

2. Adding cameras

This task will add 2 cameras to the robot model.
a) By modifying `custom_description.urdf.xacro` in package `husky_custom_description`, using 2 fixed joints, add two box links to the `top_plate_front_link` and `top_plate_rear_link`, make sure they do not intersect with other parts of the robot.
b) Using these two links add the camera plugin configuration.
c) Use rqt to visualize the output of the two cameras. Don't forget to exit from the running environment with Ctrl-C, it's not enough to exit from Gazebo.
d) List the new topics that got created.

3. Adding LIDAR

This task will add a LIDAR to the robot model.
a) Using a fixed joint, add a cylinder link to the `top_plate_link` and make sure they do not intersect with other parts of the robot.
b) Using this link add laser plugin configuration.
c) Use RVIZ or rosshow to visualize the output of the LIDAR. What did you have to change in the configuration to make it show?
d) List the new topics that got created.

4. Adding GPS

This task will add GPS the robot.
a) Add the GPS plugin to the `base_link` link. The starting position is 0.0, 0.0.
b) List the new topics that got created.
c) Use `rostopic echo` to output GPS information
d) Using RVIZ or `teleop_twist_keyboard` move the root to these coordinates:

```
latitude: 0.00016
longitude: 3.2e-05
```