Fontys university of applied science ***Adaptive robotics minor***

P3 project autonomous toilet cleaner

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Intro:

This is a description document of a Ros simulation package created for the project "*P3 project autonomous toilet cleaner".*
The document will explain the gazebo, robot description, Slam_gmapping, navigation, iraLaserTools, and moveit integration packages.
A demo video can be found at: https://youtu.be/FsXPII8OoOU

Gazebo environment:

The environment consists of two main spaces. The first one simulates a main area (living room , office ..), the second is a main space that has access to a toilet space. The environment was created to simulate a scenario where the robot can perform mapping and navigation tasks.

Robot description:

Models:

The package consists of two main 3D models. A design provided by the manufacturer, a holonomic platform where the arm is mounted, and 3D models of RGB, depth, and lidar sensors.

Ros Plugins:

The description package includes multiple ROS/Gazebo plugins:

- Libgazebo_ros_planar_move : for holonomic movement simulation.
- Libgazebo_ros_control,
- libgazebo_joint_control,
- libgazebo_joint_state_publisher,
- Libgazebo_joint_trajectory_server: for publishing and controlling the arm joints state using moveit.
- Ros transmissions : to simulate joints control.
- Libgazebo_ros_laser: to simulate lidar sensors.
- Libgazebo_ros_openni_kinect: to simulate rgb and depth cams.
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Control files:

A .yaml file that includes configurations used further by movit to control the arm.

World file:

Includes the design of the environment.

Launch files:

- Gazebo.launch: not to run, included in robot.launch
- Arm.launch: not to run , included in robot.launch
- Robot.launch : starts the robot and arm simulation in gazebo.
- Slam_gmapping.launch : start the nodes required for gmapping.

Launch commands:
$ roslaunch toiletcleaner robot.launch
$ roslaunch toiletcleaner slam_gmapping.launch

Tcnav:

The package include teb.launcn file to start the ROS nodes required to perform navigation using Teb local planner and dwa global planner.
Launch command:
$ roslaunch tcnav teb.launch

IRA_laser_tools:

Used to merge the data from both lidars and publish results on /Scan topic.
The nodes are started at the launch of toiletcleaner/robot.launch

TcMoveit:

The package contains moveit configuration files and a launch file to start required nodes in order to simulate moveit integration with the robot.
Launch command:
$ roslaunch tcmoveit tc.launch