EE-562 : Robot Motion Planning
Problem Set # 3

Spring 2013-14

Due Date : Feb 24, 2014.
Total Points : 100.

Tangent Bug Algorithm in Gazebo

Implement Tangent Bug algorithm in Gazebo using ROS and keeping in view the following details.

Robot: A mobile robot with four wheels and a main body. Force can only be applied on the front two wheels. Note: The tutorial include a two wheeled robot.

Environment: Use the default Gazebo environment.

Obstacles: The obstacles are of the following type:

box parameterized by eight corners or an origin with length, width and height.

Sphere parameterized by center (x,y) and radius r.

Cylinder parameterized by center (x,y), radius r and height h.

Others Any other obstacle using meshes can also be used.

Robot Position and Goal: The current position of the robot is (Xc, Yc, θ) and the goal is (Xg,Yg).

Sensor: The range of the sensor is R and its resolution is rx. Resolution is the difference in degrees between two consective scans.

Movement: The Robot covers distance after applying some force on the joints.

ROS Nodes: You can add as many nodes as you wish.

Parts of Homework2 to be Used or Modified

1. The robot is now represented by both position and orientation i.e. (x, y, θ).
2. Obstacle detection should be modified to incorporate box, sphere and cylinder instead of square and circle. The underline principle of detection can be the same.

Hints and Good Practices

1. Sensor can still work in just 2D but 3D can also be incorporated i.e. sensor rays that span a sphere instead of circle.
2. First find how much force on each joint is required to travel a certain distance in straight line and taking a turn using an arc.

Deliverables

1. Send all the code of the whole package that should execute without errors.
2. A mobile robot should move from start position to goal using the tangent bug algorithm avoiding any obstacles in the way.
3. Orientation of the robot at the goal does not matter as long as its center is at the goal.