

UNIVERSITY OF COLORADO - BOULDER
Robotics Program

ROBO 5000 (CSCI 5202) - Intro to Robotics

Challenge Problem #2 (Assigned: Tuesday 2/11, Due: Tuesday 2/25 11:59pm on *Canvas*)
Path Planning

Instructions

For this challenge problem, please prepare a short writeup (1-2 pages) detailing your solution to this problem. Also submit all code files needed for your solution. Be sure to comment code so the grading staff can easily follow your logic. **You are encouraged to discuss your work with your team member. Please indicate in the header of your code who your team member is. You are not encouraged to discuss this with any individual outside your team.**

Please complete all programming questions in a single .py file with the naming convention "Last-Name.FirstName.py". For example, my submission file would be called "Beuken.Leopold.py".

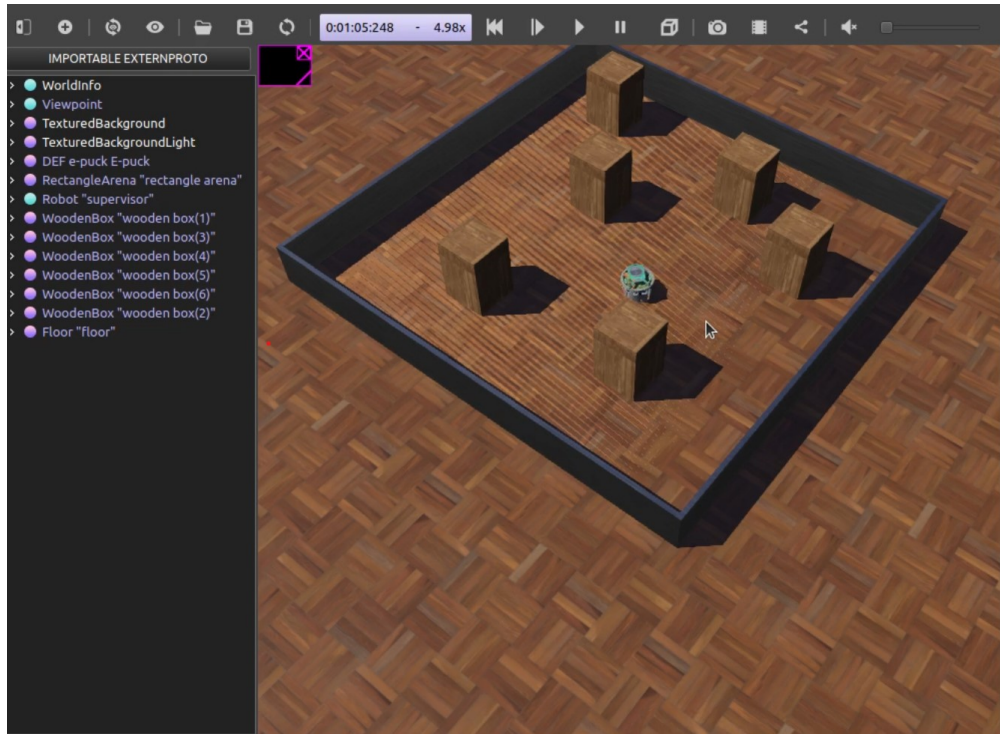
1 Nonholonomic RRT

1.1 Planning - 40 points

You have been provided a Webots world file that consists of the E-puck robot enclosed in an arena. The goal state for the robot is $(x,y,z) = (0.6,0.6,0)$.

The goal is to implement RRT with 50% goal bias to plan a path from the robot's initial state to the goal region. For this purpose, the randomly sampled state is sampled within the arena dimensions. Once sampled, use 5 collision-free Monte-Carlo propagations from the robot's current state with varying actions and time duration. Pick the best propagation that leads the robot the closest to the randomly sampled state and add that to the tree. Discard propagation branches that result in the robot being in collision with an obstacle.

Once the tree reaches the goal region, which would be a circle of radius 0.1 m from the goal state, stop the simulation. This implementation requires active communication between a supervisor robot and the e-puck via emitter-receiver pairs that are mounted on them. In addition to the solution code, attach a video or a GIF of the robot performing the task.



1.2 Deploying the solution - 10 bonus points

Once the tree reaches the goal region, which would be a circle of radius 0.1 from the goal state, reset the simulation and deploy the series of propagations that lead the e-puck from its initial state to the goal state. In addition to the solution code, attach a video or a GIF of the robot performing the task.