Lab 3: Motion Planning with a 6-DOF Manipulator
Group 7

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1 Theory Questions

Q5: Change the build method so that it calls `_get_random_sample_near_goal` with probability 0.2 and `_get_random_sample` with probability 0.8. Reduce ϵ to 0.2. What do you observe?

Sol: The RRT has a balance in exploring regions near the goal and the rest of the configuration space. Using `_get_random_sample_near_goal` speeds up the computation and reduces the number of samples required to reach the goal compared to using only `_get_random_sample` for the goal precision of 0.2. `_get_random_sample_near_goal` also sets a small distance around the goal (0.05). This helps to improve the proximity of the final configuration from the goal.

Q6: Why not calling `_get_random_sample_near_goal` with probability 1.0? Present an example where this could be problematic.

Sol: If `_get_random_sample_near_goal` is called with probability 1.0, the exploration of the search space would be biased towards the goal. As a result, the RRT won't explore other parts of the search space. An example where this could be problematic is if there are complex obstacles (forming non-convex regions), causing the RRT to get stuck in a local optima and preventing it from reaching the goal (or slowing down the search).