Discussion Questions

Parasol Planning Library

1. What are the output files generated by PPL? What information does each contain? Name the tool to view environments, roadmaps, and paths.
2. Compare and contrast Bridge Test and Obstacle Based sampling method shown in Fig.1. What is the expected cost per sampling attempt for each sampler?

1. Bridge Test

Algorithm
1. $q_1 \leftarrow$ RandomCfg()
2. **if** $\neg$Validity(q_1) **then**
3. $q_2 \leftarrow$ GaussianDAway(q_1, d)
4.   **if** $\neg$Validity(q_2) **then**
5. $q_3 \leftarrow \frac{q_1 + q_2}{2}$
6.   **if** Validity(q_3) **then**
7.   **return** q_3
8. **return** *NULL*

2. Obstacle Based

Algorithm
1. $q_{rand} \leftarrow$ RandomCfg()
2. $q_{dir} \leftarrow$ R
3. **do**
4. q_{prev}
5. $q_{rand} \leftarrow q_{rand} + q_{dir}$
6. **while** Validity(q_{prev}) = Validity(q_{rand})
7. **return** WhichValid(q_{prev}, q_{rand})

3. Uniform Random

Algorithm
1. $q_{rand} \leftarrow$ RandomCfg()
2. **if** $Validity(q_{rand}) = true$ **then**
3.   **return** q_{rand}
4. **else**
5.   **return** *NULL*

4. Gaussian

Algorithm
1. $q_1 \leftarrow$ RandomCfg()
2. $q_2 \leftarrow$ GaussianDAway(q_1, d)
3. **if** Validity(q_1) $\neq$ Validity(q_2) **then**
4.   **return** WhichValid(q_1, q_2)
5. **else**
6.   **return** *NULL*

d = mean and std. dev. of a normal distribution:

$N(\mu, \sigma) = N(d, d)$

5. Medial Axis

Algorithm
1. $q_{rand} \leftarrow$ RandomCfg()
2. **return** PushToMA(q_{rand})

Medial axis is reached when identity of nearest **witness** cfg changes

Medial axis is the set of all points equidistant to two or more obstacles

Fig. 1

* Refer to the pseudocodes in Fig 1 to answer questions 3 - 6

3. Explain the visual differences in sampling methods in Fig. 1. Essentially, list each sampler and state where the samples are located.
4. In the sampling experiment, we were looking at success rates of samplers over 100 attempts. Explain why each sampler had the success rate it did.
5. Why is collision detection a measure of efficiency in motion planning?
6. What is the expected cost per sampling attempt for each sampler? Given 100 sampling attempts, like in the experiment, do the results match your expectations? Explain any anomalies in the data.
7. In the connection experiment, how does varying *k* affect collision detection calls .Does this trend always hold? Why does the number of collision detection calls more than double in your plots?

8. Why would we want a higher *k* value for connection? (Hint: Think about solution dn roadmap quality)