

Assignment #2 - Comparison of RRT and RRT* Implementations

Obstacle-Filled Environment

Figures 1 and 2 below depict the obstacle environment that I generated to test both RRT and RRT* algorithms. Figure 1 shows the result of the RRT algorithm on random instance i=999 and figure 2 shows the results of the RRT* algorithm on random instance i=999.

Note. `numpy.random.seed(1)` was used to generate the following results.

Figure 1 - result of RRT on instance 999

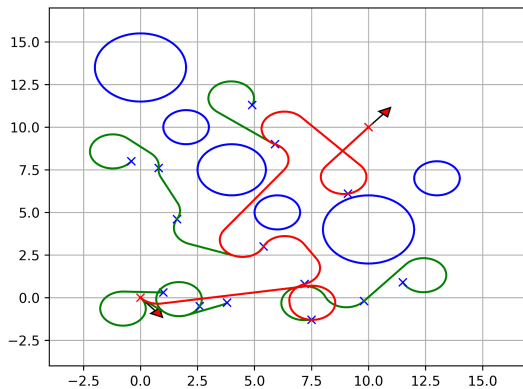
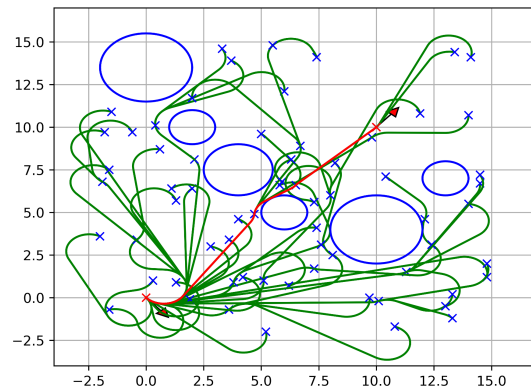


Figure 2 - result of RRT* on instance 9

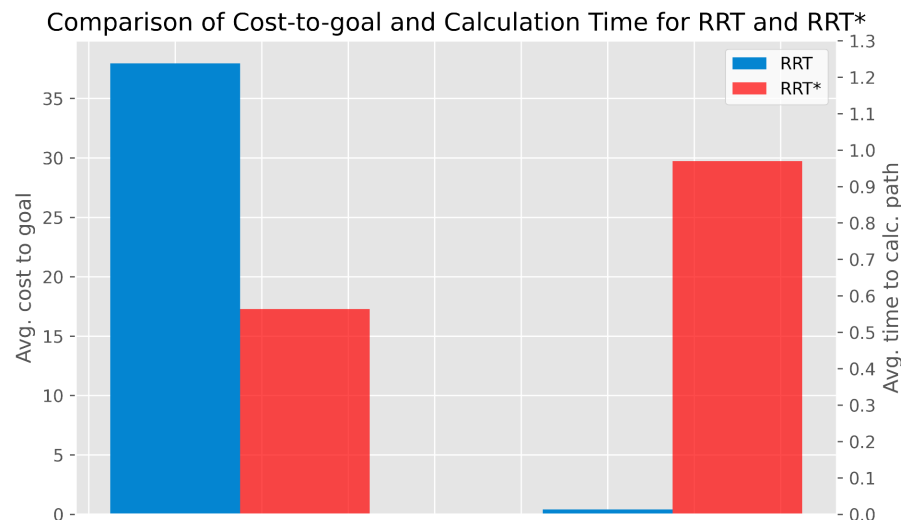


Results after Monte-carlo Simulation of 1000 Random Instances

After running both RRT and RRT* algorithms 1000 times, the following results were obtained:

- **Average cost-to-goal:** RRT = 37.95, RRT* = 17.29
- **Average time to compute:** RRT = 0.014 sec, RRT* = 0.969 sec
- **Failed attempts out of 1000:** RRT = 42, RRT* = 0

Figure 3 - comparison chart



Conclusion

In conclusion, RRT* results are on average 50% better than the results obtained from RRT. From figures 1 and 2, we can see the rewiring in RRT* results in straighter, more direct paths. Lastly, RRT failed to find a solution in 4.2% of trials while RRT* never failed to find the goal