1. **A succinct statement of the problem that you solved.**

In this project, we planned for more complex systems with dynamical constrains on their motion. The system contains different constrains other than its position. More specifically, we do motion planning for a Torque-controlled Pendulum System, and a Car-like system. , and we defined a projection for the state space for pendulum and car system, and solved problems using the KPIECE planner. We also implemented a new planner named RG-RRT **[…]**

1. Images of your environments and description of the start-goal queries you are evaluating.
2. **A short description of the robots and configuration spaces.**

For the Torque-controlled Pendulum System, the robot is a Torque-controlled Pendulum described by the orientation of the pendulum () and its rotational velocity (). Therefore, the configuration space for the pendulum is rotation in 2D space, and the angular velocity. Thus, the configuration space is. For the Car-like system moving in a street environment, the state of the system is represented by its positionheading angularand forward velocity Therefore, the configuration space for the car system isindicating that car is translating and rotating in 2D space and has velocity vector.

7. Rate the difficulty of each exercise on a scale of 1-10. Give an estimate of how many hours you spent on each exercise, and detail what was the hardest part of the assignment. Additionally, for students who completed the project in pairs, describe your individual contribution to the project.

Exercise1: difficulty 7. Estimate hours: 8 hours.

Exercise2: difficulty 6. Estimate hours: 4 hours.

The most difficulty part of the first two exercises would be understanding the ODESolver and projection. We spend some time on reading example codes provided in OMPL demos. We also spend tons of time solving some typo bugs. Those small bugs are really time consuming and hard to find.

Contribution:

Haoran Liang implemented the first two exercises including solving the pendulum and car-like system problems.