Trajectory Planning and Trajectory Optimization for Autonomous Vehicles

- Safe Motion Planning for Autonomous Vehicles in Uncertain Traffic Environments.

Introduction: Driving in uncertain traffic environments may cause collision. Therefore, there needs a safe motion-planning framework considering the traffic uncertainties. In this project, a method for autonomous vehicles motion planning will be investigated for solving this problem. Different approaches in the literature, like robust optimization and scenario optimization, have been established to deal with uncertain optimization problems, and you are expected to investigate these methods and try to apply them in practical motion-planning problems for autonomous vehicles in uncertain scenarios.

- Trajectory Optimization Using Model Predictive Control for Autonomous Vehicles in Dynamic Traffic Environments.

Introduction: Motion planning in dynamic traffic environments is a challenging topic. Model predictive control (MPC), due to its inherent online planning and replanning abilities, is suitable to optimize the trajectories for autonomous vehicles in dynamic scenarios. In this project, you are expected to firstly investigate the methodology of MPC (mainly nominal MPC), then formulate the optimization problem in MPC to plan the optimal trajectory for an autonomous vehicle subject to collision-avoidance constraints with time-varying obstacles, and finally solve the problem to generate the trajectory.