

Project 07 Highway Driving

Introduction

The goal of this project is to build a path planner that creates smooth, safe trajectories for the car to follow. The highway track has other vehicles, all going different speeds, but approximately obeying the 50 MPH speed limit.

Rubric Points

Compilation:

Code compiles without errors with cmake and make.

Valid Trajectories:

- The car is able to drive at least 4.32 miles without incident.
- The car doesn't drive faster than the speed limit. Also the car isn't driving much slower than speed limit unless obstructed by traffic.
- The car does not exceed max acceleration and jerk of 10 m/s^2 and a jerk of 10 m/s^3 respectively
- Car does not have collisions.
- The car stays in its lane, except for the time between changing lanes.
- The car is able to change lanes when needed.

Reflection

There are three main parts to the implementation of trajectory planning:

- Checking to see if there are other vehicles nearby that are going in the same direction.
- Based on the nearby vehicle check, a decision is made if the car needs to change lanes, stay in the same lane or reduce the speed of the vehicle.
- Waypoints are generated to give a path indicating potential future points of the car and are calculated with an aim of following maximum velocity, acceleration and jerk numbers.

Waypoints are classified further into anchor points and spline points. There are 5 anchor points. 3 of them are points which are a set 30m, 60m, and 90m away from the current position. 2 of them are taken from the path previously travelled. This helps in continuity and avoids exceeding velocity/acceleration/jerk limits between calculations. Spline points are points which are interpolated between anchor points. These adjust how far the vehicle will travel in between time intervals along the curve without exceeding set limits. For calculating the waypoints, the points are transformed from the inertial coordinates to the car coordinates for ease of calculation and later transformed back into the inertial coordinates to pass it to the simulator.