Model Documentation

The Goal of this Project

In this project, goal is to design a path planner that is able to create smooth, safe paths for the car to follow along a 3 lane highway with traffic. A successful path planner will be able to keep inside its lane, avoid hitting other cars, and pass slower moving traffic all by using localization, sensor fusion, and map data.

Vehicle

This class is used to represent self-driving car and others cars along the road. Vehicle instances are updated every time the program receives a telemetry event from the simulator.

Road

The Road class instance stores the updated sensor fusion data and also implements some helper functions to help in lane change decisions.

Trajectory Generation

Spline library is used to generate Jerk free trajectory.A list of widely spaced waypoints are generated each with 30 meters apart.Then the rest of points are then interpolated such that reference velocity is maintained.

The generated points also contain lane as one of the parameters this helps in generating trajectory for lane change by changing the lane value.

Lane Change

Using the velocity of the self driving car a future ***s*** value is predicted . If any vehicle is within a safe distance of this ***s*** value vehicle speed is first lowered. Then given the sensor fusion data it's checked what is the best lane to be.This is done by checking ***s*** values of all the vehicles in other lanes and if there is a safe gap to perform lane change.

If the best lane is different form the current lane a lane change is performed.Just before a lane change it's checked if there is any speeding vehicle which could cause collision during lane change.

Reflection

In the current lane change implementation there is a possibility of a collision if there are vehicles in the selected lane which are travelling at very high speed while the lane change is being performed. There is no way to abort a lane change one initiated.
Also in case of keep lane behaviour if there is a slow vehicle ahead and the current car is blocked from making a lane change it will keep accelerating to reference velocity and

deceleration even though the jerk is within the limits such behavior is not comfortable. Self Driving Car should just try to maintain a constant velocity.