Model Documentation

Following project rubic, my car is bale to drive over 4.32 miles without any incident. It drives along center lane and can avoid any slow traffic. The car is able to change lane when there is slow traffic and no other car at its side. The project walk-through is very helpful and I also used some of those codes. Hope this will not violate the rule of project. The detail are described below:

In main function, at line 223, I set lane = 1 to let my car start and stay drive at center lane. At line 224, I set reference velocity == 0.0. It will give a smooth start and without exceed max acceleration and jerk. When start to drive, the reference velocity will increase at 0.23 every step which is equal to 6 m/s. The speed limit is 50 mile/hour. At line 311, the reference velocity will be less than 49.1 mile/hour which is within speed limit.

By using sensor fusion technology, it is able to check all other cars on the same side of the road. If too close, the velocity of car will be decrease by 6m/s roughly.

From line 345 to 347, I am calculating the points ahead in 30m, 60m, and 90m space from my car’s current position, then transfer from Frenet coordinate to Cartesian coordinate.

From line 357 to 363, the car’s global coordinate is transfer to local coordinate to simplify math.

From line 368, spline function is used to generate 5th degree polynomial to obtain local XY coordinate. X position is obtained from the calculation by relative target distance, then Y position is easily interpolated by spline function. Then push those value to next x or y value in the program.

If the front car is too slow, changing lane is required. From line 287 to 342, I initialize 3 boolean parameter car\_front, car\_left and car\_right to describe the status of surrounding circumstance. Since the width of lane is 4, curr\_lane is used to determine which lane the car is currently in. based on the prediction, my code will increase or decrease velocity, or make decision to change lane if there is no other car around us. ref\_vel is designed to be parameter for speed change when generates trajectory.

From line 344 to 435, the code is used to calculate the trajectory based on current car coordinate, past path points and current speed. From line 344 to 395, the previous path points and three projected points which are obtained by converting from Frenet coordinate are used for spline calculation. For simplification, all points are in local car coordinate. The rest of points are calculated by spline function and transform output coordinate to local coordinate. Then assign those points to next position to implement path trajectory.