Highway Driving Project

Goals

In this project the goal is to safely navigate around a virtual highway with other traffic that is driving +-10 MPH of the 50 MPH speed limit. Simulation will provide the car's localization and sensor fusion data, there is also a sparse map list of waypoints around the highway. The car should try to go as close as possible to the 50 MPH speed limit, which means passing slower traffic when possible, note that other cars will try to change lanes too.

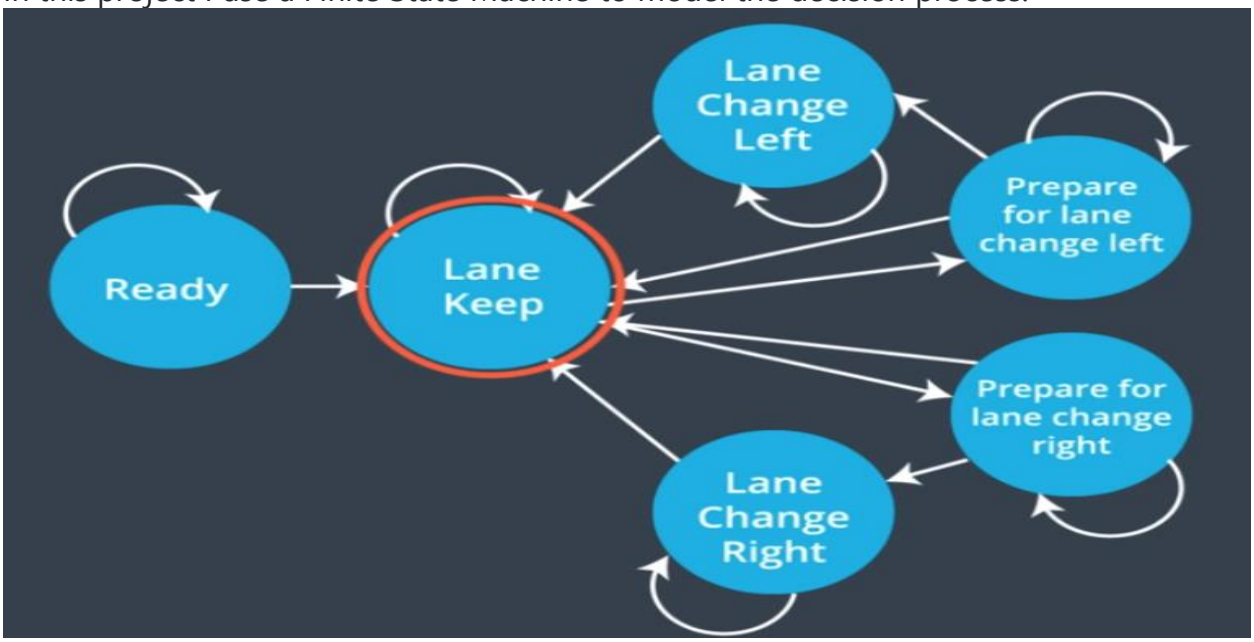
The car should avoid hitting other cars at all cost as well as driving inside of the marked road lanes at all times, unless going from one lane to another. The car should be able to make one complete loop around the 6946m highway. Since the car is trying to go 50 MPH, it should take a little over 5 minutes to complete 1 loop. Also the car should not experience total acceleration over 10 m/s^2^ and jerk that is greater than 10 m/s^3^.

Prediction of other cars

Prediction in this problem setup is simplified. We can predict the positions of the cars around us using the x,y, theta and speed in the last frame.

Behavior Planner

In this project I use a Finite State Machine to model the decision process:



Path Planner

Since highway is much simpler than urban environment, complex search algorithm is not necessary. Base on the decision of Behavior Planner, we can project some points on the target lane, and connect them with some of the points in our previous path using splines to create a smooth path.

Another possible solution is to sample some points in a small area on the target lane, and connect them with the car using quintic polynomials. Then we can choose the polynomial with minimum jerk and discard the others.

The solution code can be found in:

- workspace>
- CarND-Path-Planning-Project>
- **src**

Spline.h file has been included to generate curve using spline form. The required coding changes are done in main.cpp file.