Hi~

The project that I had built can meet all the requirements in the project rubric.

1. The car is able to drive at least 4.32 miles without incident.

To meet this requirement, I had built the whole system of our path planning module. First, I loaded the map data from the csv file. This was used to make the coordinate system transition between cartesian coordinate system and frenet system.

Then, based on the result of sensor fusion system as well as the location of our host car and the information of road to build a FSM module to make the decision model to make the behavior planning containing.

Then, I used a spline curve fitting method to generate the path points that length is 50. To smooth the path between two iteration, I involve the previous path points to generate new path.

That is all my points in this project!

2. The car drives according to the speed limit.

If host car violates the speed limit, I will reduce speed by a certain rate of deceleration.

```
else if(ref_vel < 49.5)
{
  ref_vel += 0.224;
}
```

3. Max Acceleration and Jerk are not Exceeded.

To meet this requirement, I initialized the initial velocity with 0 mph.

```
double ref_vel = 0; /
```

I used a small acceleration value to incrementally increase the velocity of our host car.

```
if(too_close)
{
  ref_vel -= 0.224; // around fine meters per second squared
}
```

4. Car does not have collisions.

I designed the strategy to avoid obstacles on the road, if there was a car in front of host car and is closed to me. I will set the flag value true to reduce velocity of host car and prepare to change lane.

```
if(is_in_front_of_us && is_closer_than_safety_margin)
{
  // Do some logic here, lower reference velocity so we don't crash into the
  // ref_vel = 29.5; // mph
  too_close = true;
  prepare_for_lane_change = true;
  // if(lane > 0)
  // {
  //   lane = 0;
  // }
}
}
}
```

5. The car stays in its lane, except for the time between changing lanes.
   Host car will stay in lane 1 until the lane change flag changed to true.

6. The car is able to change lanes
   After host get into prepare lane change state due to the object in front of us, if the environment is clearly enough, FSM module will change vehicle state to lane change model, and based on the currently lane, host car will change lane right or left.