The Model

* Variables
  + X, Y, PSI (ANGLE), Speed V, CTE (cross track error), epsi (Error in psi)
  + Actuator inputs are
    - Steer value
    - Throttle value
  + You have equations governing the STATE(Previous) and STATE(Next)
  + Reference points are given and u got to find the predicted trajectory as close to that.
  + So, it becomes a Constrained optimization problem.
* Unique things I did
  + I have kept a lower and higher bound for the velocity.
  + Have given extra cost for CTE and EPSI also have given more cost to extra deviations in the steering angles.

Timestep Length and Elapsed Duration (N & dt)

* I just tried manually a lot of lot variations of “dt” and “N”.
  + N is 10
  + Dt is 1
    - Were empirically giving better results.
    - Also, when I plotted the green and yellow lines giving extra N does not make extra sense (for dt 1).

Polynomial Fitting and MPC Pre-processing

* I have kept it simple because it worked for me
  + Have fitted line to the points converted to the car coordinate.
  + auto coeffs = polyfit(x\_p, y\_p, 1) ;

Model Predictive Control with Latency

* As there is latency, vehicle will be in a different position when u apply the controls. So the assumption is lets apply the controls on the state after the latency.
* So, after latency.
  + X is “v \* latency”
  + Psi is” -v \* steer angle \* latency / 2.67”.
  + Y is 0.0
  + cte is polyeval(coeffs, 0);
  + epsi is -atan(coeffs[1]);