## 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]);