Report

1. Students describe their model in detail. This includes the state, actuators and update equations.

The model includes the vehicle's positions (X, Y), car orientation (psi), car driving speed (v), cross track error (cte) and orientation error (epsi). Below lists the corresponding update equations. Furthermore, the model includes acceleration (a) and drifting angle to simulate actuators.

$$
\begin{aligned}
x_{t+1} &= x_t + v_t * cos(\psi_t) * dt \\
y_{t+1} &= y_t + v_t * sin(\psi_t) * dt \\
\psi_{t+1} &= \psi_t + \frac{v_t}{L_f} * \delta_t * dt \\
v_{t+1} &= v_t + a_t * dt \\
cte_{t+1} &= f(x_t) - y_t + v_t * sin(e\psi_t) * dt \\
e\psi_{t+1} &= \psi_t - \psi des_t + \frac{v_t}{L_f} * \delta_t * dt
\end{aligned}
$$

2. Student discusses the reasoning behind the chosen N and dt. Additionally the student details the previous values used.

Time duration is N * dt. In the model , I chose N is 10 and dt is 0.1. Therefore the time duration is 1 s. It means the model updates the status, does fitting and determines the right trajectory in 1 s. I also tried 20 * 0.5s, 40 * 0.25 s. 10 * 0.1 follows audacity class.

3. If the student preprocesses waypoints, the vehicle state, and/or actuators prior to the MPC procedure it is described.

Inspired by Jeremy Shannon's work, I also converted waypoints from map coordinate to the vehicle coordinate. The fitting is significantly simplified. Initial positions and orientations are 0, 0, and 0.

4. Student provides details on they deal with latency.

In order to compensate the latency effect, actuators are updated in terms of previous status. Please check line 101 to 106 in MPC.cpp.