Q: Student describes their model in detail. This includes the state, actuators and update equations.
A: The vehicle model used is a kinematic model. The states are global x position, y position, heading (psi), and vehicle speed (v). The actuators are the steering (delta) and throttle (input). There are four update equations to describe each state one time step into the future. X one time step into the future is simply the current x position plus the x component of the vehicle velocity multiplied by dT. Similarly, y one time step into the future is simply the current y position plus the y component of the vehicle velocity multiplied by dT. Velocity one time step into the future is simply the current velocity plus the acceleration multiplied by dT. Finally, heading psi one time step into the future is the current psi plus steering angle multiplied by velocity divided by Lf multiplied by dT. Lf is the distance between the front of the vehicle and its center of gravity.

Also, the cross track error, cte, and orientation error, epsi, are also state variables. The cross track error measures the lateral distance between the vehicle and its trajectory. The orientation error is the difference between the desired heading and the vehicle's actual heading.

Q:Student discusses the reasoning behind the chosen N (timestep length) and dt (elapsed duration between timesteps) values. Additionally the student details the previous values tried.
A: Initially, I had tried to use dt=0.05, but then realized this value was smaller than my latency of 0.1seconds. I then increased my dt to match my latency, and decreased N to 20 so that I was not predicting more than a couple seconds into the future.

Q:If the student preprocesses waypoints, the vehicle state, and/or actuators prior to the MPC procedure it is described.
A: The waypoints were converted from global coordinates to local vehicle coordinates and then these local coordinates were used to fit a third order polynomial.
As mentioned below, the vehicle state is predicted to 100ms into the future using kinematic equations, and this predicted state is fed into the solver.
The steering angle is negated to account for the sign difference between the simulator and convention used in class.

Q:The student implements Model Predictive Control that handles a 100 millisecond latency. Student provides details on how they deal with latency.
A: To deal with latency, the vehicle state was predicted 100ms into the future, and then this predicted state was fed into the solver.