Reflection

Describe the effect each of the P, I, D components had in your implementation.

The P component is the **propotional** controller. It changes steering angle in propotion to the crosstrack error. With just the P component, I observed that the car oscillated around the center of the track going left and right and eventually veered off the road. This is expected since with just the P component, as shown in the lecture the car overshoots and undershoots

The D component is the **differential** controller. It changes steering in proportion to the derivative of the crosstrack error. The D- component helps dampen the oscillations and with a P and D controller, the car is able to drive around the track though the driving pattern is not very smooth. I think this is also expected behavior because as shown in the lectures with and P and D controller a car is able to follow the track if there is no steering drift. It seems to drive in a wavy fashion along the center of the road. While the driving is not dangerous, its no fun sitting in a car that drives like this!

The I component is the i**ntegral** controller. It changes steering in proportion to the sum of crosstrack errors. This term is needed to fix any bias in the steering and correct for drift. I added a small integral component. I don't think there is any material bias in the steering, so for me the I component didn't have a big impact on the steering.

Describe how the final hyperparameters were chosen.

I chose the P, I and D components through **manual tuning**. I experimented with just a P controller but that caused the car to oscillate a lot. So I added a D component to dampen the oscillations. I found that the car was able to drive around the track for a lot of values of P and D. I added a small I component but it didn't seem to have a material impact on driving around the simulator. Higher values of D component, dampened the oscillations more.
I also increased the throttle and found that a slightly adjusting the P, I and D components ensured that the car was able to drive around the simulator.