Udacity PID Project reflection

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1. **Describe the effect of the P, I, D component of the PID algorithm in their implementation.**

Answer:
In the project ‘main.cpp’, I set the coefficient of PID gains: Kp = 0.07, Kd = 0.9, Ki = 0.0005. PID consist of three terms - proportional, deviations and integral term.

We want to minimize the crosstrack error by changing steering angle which is proportional by the the proportional term’s coefficient - Kp. Large Kp can make CTE decearse/ oscillate faster and also overshoot easier

To avoid the overshoot, add the deviations term in control equation. It’s means when the speed of reduction of crosstrack error is too fast, the derivation term help to slow rapid changes in CTE.

The integral term help to compensate the bias.

2. **How i chose the final hyperparameters (P, I, D coeffcient)**

Answer:
This had been done through manual tuning. I add P, I and D terms one by one.
Firstly, I set the Ki and Kd values to zero. Increse Kp from 0.

When Kp = 1.0, compare p_error, i_error and d_error with Kp = 10.0 and other value, the error shows Kp = 1 better than larger value, and then I keep decrease Kp, Kp = 0.07 in the end.Next I add Kd until the oscillations about centerline began to decrese/ stable.And then I add Ki’s value with a small integral correction term.