

Writeup for PID Control Project

How do I determine P, I, D value and their effect:

P value: I tried several times to tune P value, I think this value depends on how sharp the turn is, if there is a really sharp turn, P should be large in order to get to the center line in time, otherwise ego car would be thrown out of the road, P represents how fast ego return to center line. I tuned this parameter first, 0.3 seems to be able to handle the sharp turn, if P value is smaller than 0.3, ego car tends to fail to turn when there is a sharp turn.

D value: I used some code to help me determine this parameter, at first I set a relative small number to D, then I increased this number every 30 steps(code shown in image1), then I check the cte value and choose the D parameter with less overshoot, this parameter represents stability, an appropriate D value decreases overshoot. Variable coo is how much I increases 'Kd' every 30 step. I choose 30 steps is because I think 30 steps is long enough to see if ego car overshoot too much.

```
70 ▾          if(count%30==0) {  
71              pid.Kd+=coo;  
72              std::cout<<pid.Kd<<std::endl;  
73          }
```

Image1

I value: this parameter is used to decrease systematic bias, this should be a relative small number, because we only want it to work when ego car is off center line for a long distance, if I set it to zero, ego car is still be able to run the whole loop, but the cte is positive for the most of the time, which means there is some systematic bias. So I set I value to 0.005, it seems to work fine.