PROJECT

PID CONTROLLER

Effect of various components on vehicle steering

1) P-component: The p component is directly proportional to the CTE (cross track error) of the vehicle. But this p-component has opposite direction of CTE since the steering is required to be opposite of the CTE to reduce the CTE. If we consider only the p-component to calculate the vehicle steering angle, it was observed the vehicle oscillates wildly along the centre line of the lane and finally crosses over the edge of the road on to the non-drivable region.
   I tried with p-component value 0.1 while kept the other component values 0.

2) P & D-component: The D component regularly reduces the steering angle to converge the vehicle movement to a fixed line. I introduced the D-component also along with the P-component to calculate the steering angle value. I observed that even though the vehicle remained on the track all the time but it stayed away from the centre line of the track. I felt that there was some other force also that prevented the vehicle from staying in the centre of the lane. On further analysis I understood there might be some bias in the steering that caused this.
   I tried with values 0.1 for P and 1.5 for d component.

3) P & D & I component: The I component works in reducing the effect of any bias in the steering system. To cope with the steering bias I tried by introducing a very small I component value also to calculate the steering angle value. Miraculously that did do wonders. The vehicle now remained close to the centre of the lane during most of its run. I used an I value of 0.004.

How the hyperparameters were chosen

I used manual tuning to get to these hyperparameters values. It was very time consuming though. I wish I could have used twiddling to achieve the same. But I could not find a way to apply twiddling in this simulator scenario.