Tuning PID Controller:

Several method can be tried to get good PID parameters, I used trial and error to understand the impact of each parameter on the system .

I finally used these PID parameters:
Kp = 0.6
Ki = 0.001
Kd = 6.0
I recorded a complete lap around the track . The recording in the path: videos/pid-P4.wmv

Impact of Kp:
The propotional part is straight forward.Increasing it too much produces overshooting and decreasing it too much make the car doesn't return on track if it is on the road side.

Impact of Kd:
The differential part should decreases the overshooting produced by the proportional part.
Basicly , Increasing this part improves overall performance .
Increasing it too much(i tried 20.0) suceeded to prevent overshooting of CTE (CTE is v small most of te time) but the steering itself become very unstable to keep the CTE minimum .
I recorded a small video showing this effect in the path: videos/d-error.mkv

Impact of Ki:
The Integral part is responsible for compensating systematic bias of the car . I tried some values and realized that it should be very small . Over-estimating the systematic bias of the car ((i tried 0.9) makes the algorithm outputs a very high steering angle in a situation which a lower angle is required to compensating the wrong systematic bias that was introduced. The result is so bad of course.
I recorded a small video showing this effect in the path: videos/i-error.mkv

Further work that could be to :
-Implement an twiddle algorithm to tune the PID parameters.
-Design another PID for controlling the car throttle command depending on the required steering angle change and the CTE error.