REFERENCE

http://eprints.gla.ac.uk/3815/1/IEEE_CS_PID_01580152.pdf

TABLE 1 **Effects of independent P, I, and D tuning on closed-loop response. For example, while K_I and K_D are fixed, increasing K_P alone can decrease rise time, increase overshoot, slightly increase settling time, decrease the steady-state error, and decrease stability margins.**

	Rise Time	Overshoot	Settling Time	Steady-State Error	Stability
Increasing K_P	Decrease	Increase	Small Increase	Decrease	Degrade
Increasing K_I	Small Decrease	Increase	Increase	Large Decrease	Degrade
Increasing K_D	Small Decrease	Decrease	Decrease	Minor Change	Improve

Based on the following reference information. The tuning of the p, i and d parameters was inferred. With manual tuning the following parameters yielded the best results.

P = 0.20
I = 0
D = 2.5

1. P
Keeping I and D as 0, P was varied from 0 - 2 in steps of 0.5
With values go greater than 1 the oscillations and overshoot was very significant. And vehicle went out of the track. With p = 0.5 the vehicle was able to keep centre on straight roads but would oscillate a lot on corners.

2. D
Vary the D value to reduce oscillations.With D greater than 1.5 the oscillations was reduced significantly but in sharp corners the vehicle was going off track. With D = 2.5 the vehicle stability was improved a lot.

3. I = 0
As the simulator wheels are perfectly aligned there is not much visible difference on any particular bias over time. Any significant increase on this parameter has adverse impact on stability as error gets accumulated.

Manual tuning was able to achieve significant results to keep the vehicle stable so possibility of a twiddle was not explored.