PID Control Project

The Parameters I first set by intuition and trial and error. I changed the P [1] (the proportional factor) so that the car turned enough to take the corner, and I adjusted P [3] (the differential factor) to combat the wobbling. P [2] (the integral factor) I left at first at zero. Playing around with these parameters, I found a set that got me around the track without crashing: P[-.175 -0.01 -0.9].

I decided to the 'Twiddle' algorithm manually (I figured it would be fun to play with the simulator); I added all the absolute values of the cte's, and printed out this sum. When the car came around the first right corner, I stopped the program by pressing the escape button. The last printed sum of cte's would be my indicator of the 'Goodness', and I adjusted the P[i], accordingly. My starting delta vector:

dP [0.005 0.005 0.005]. And the adjustment I would make (like in the lessons) with a factor of 1.1 or 0.9

I input the parameters each time with the help of the commented out line for the main() function, where I could alter, and input the parameters without having to run 'make' each time.

I kept track of the P[i] 's, and dP [i]'s by penciling them into a spread-sheet.

Below is a part of that spreadsheet.

The 34th run produced the best result. I did another 74 run's but no improvement in parameters.

The sum of the dP[i] at that time was 0.0122, not as low as I had hoped for, but the car stayed in the lane for multiple laps with minimal wobbling.

I changed back the main() function, and hard coded the final results: P[-.1715756 -.0013914 -0.85459]

Finally I reduced the throttle (from 0.3 to 0.2) for an even smoother ride

Below is part of the Twiddle spreadsheet;

RUN	**P[1]**	**P[2]**	**P[3]**	**Sum_ cte**	**dP [1]**	**dP [2]**	**dP [3]**	**Sum_ dP[i]**
1	-.175	-0.01	-0.9	309	0.005	0.005	0.005	0.015
2	-1.7			332				
3	-1.8			302	0.0055			
4	-1.8	-0.005		300		0.0055		
5		-0.005	-0.85	291			0.0055	
6	-0.1745		-0.85	307				
7	0.1855			325	0.00495			
8	-0.18	0.0005		651				
9		-0.0105		>300		0.00495		
10		-0.005	-.8445	325				
11			-.8535	325			0.00495	

.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
34	-.1715756	-.00139145	-.85495	256	.004366	0.00396	0.00396	0.0122
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
108	-.1715756	-.00139145	-.85495		0.00123	0.00100	0.00112	.00335