PID CONTROLLER PROJECT

The table below illustrates how K_p, K_d, and K_i which correspond to the proportional, derivative, and integral gains of a PID controller affect the response of a system. This table taken from Control Tutorials from Matlab and Simulink: http://ctms.engin.umich.edu/CTMS.

CL RESPONSE	RISE TIME	OVERSHOOT	SETTLING TIME	S-S ERROR
Kp	Decrease	Increase	Small Change	Decrease
Ki	Decrease	Increase	Increase	Eliminate
Kd	Small Change	Decrease	Decrease	No Change

Based on these properties of the different gains, I increased the K_p of my controller until I got good response from the vehicle during turns (a manifestation of how proportional gain decreases the "rise time" of a system to a change in its reference value). However, increasing K_p also increased my car's overshoot would lead it to exit the track! I therefore increased K_d since derivative gain decreases the "overshoot" of a system to a change in its reference value. Finally, to ensure that my car reached the center of the road during straight sections of the track, I increased K_i since integral gain eliminates the "steady state error" of a system to a change in its reference value.