The effect of PID parameters are summarized as follows:

Proportional gain:

1. Make correction proportional to the current error
2. Reduce response time
3. Cause overshoot if it is too large

Integral gain:

1. Proportional to the cumulative error
2. Eliminate steady state error
3. Cause overshoot if it is too high

Derivative gain:

1. Proportional to the derivative of the error
2. Reduce overshoot
3. Reduce response time

With the properties of the each parameters, the parameters are manual tuned according to the vehicle behavior.

The final parameters are