

Main.cpp

Initialise the PID controller

Call the updateerror function and send the cte

Steering angle is the output from the controller

PID.cpp

Didn't understand how to use Init, therefore included the arguments into PID constructor

Define d_error, P_error and i_error

Calculate the controller output

Limit it between + and - 1

PID.h

Didn't understand how to use the init to initialize. Therefore included the arguments for the PID (Kp, Ki, Kd) here.

Calibration of the PID Controller

1. Started with a $K_p = 2$, $K_i = 0.0002$, $K_d = 1$ throttle at 0.3

The car steering angle were at the limits +1 and -1 and very soon ended at the bank. Clearly the K_p was too high and was unsuitable for driving

2. Tried $K_p = 0.5$, $K_i = 0.0002$, $K_d = 1$ throttle at 0.3

The car drove in a sinusoidal curve, although a lot better than before still would make one very sea-sick. The K_p had to be reduced further

3. Tried $K_p = 0.075$, $K_i = 0.0002$, $K_d = 1$ throttle at 0.3

The car was unstable and drove itself into the pond, the K_p was too low to react to the error sufficiently

4. Tried $K_p = 0.15$, $K_i = 0.0002$, $K_d = 1$ throttle at 0.3

The car drove a full length of the track well

Wanted to see how it works at a higher throttle

5. Tried $K_p = 0.15$, $K_i = 0.0002$, $K_d = 1$ throttle at 0.5

The car drove around the track but oscillated quite a bit. Should I decrease the K_d ?

6. Tried $K_p = 0.15$, $K_i = 0.0002$, $K_d = 0.075$ throttle at 0.5

The car oscillated violently and crashed on the bridge. Clearly damping less created more problems than it solved

7. Tried $K_p = 0.15$, $K_i = 0.0002$, $K_d = 1.75$ throttle at 0.5

The car completed a full lap and showed the best driving amongst all the variations tried

Didn't change K_i value → had no way of quantitating it. I understood from the lessons that it was to rectify any existing systemic errors. So chose a sufficiently small number and stuck to it

Although a simple project in comparison to the other projects, gave a very good hands on feel to how a PID controller works