

PID Controller

Compiling

Once the install for uWebSocketIO is complete, the main program can be built and run by doing the following from the project top directory.

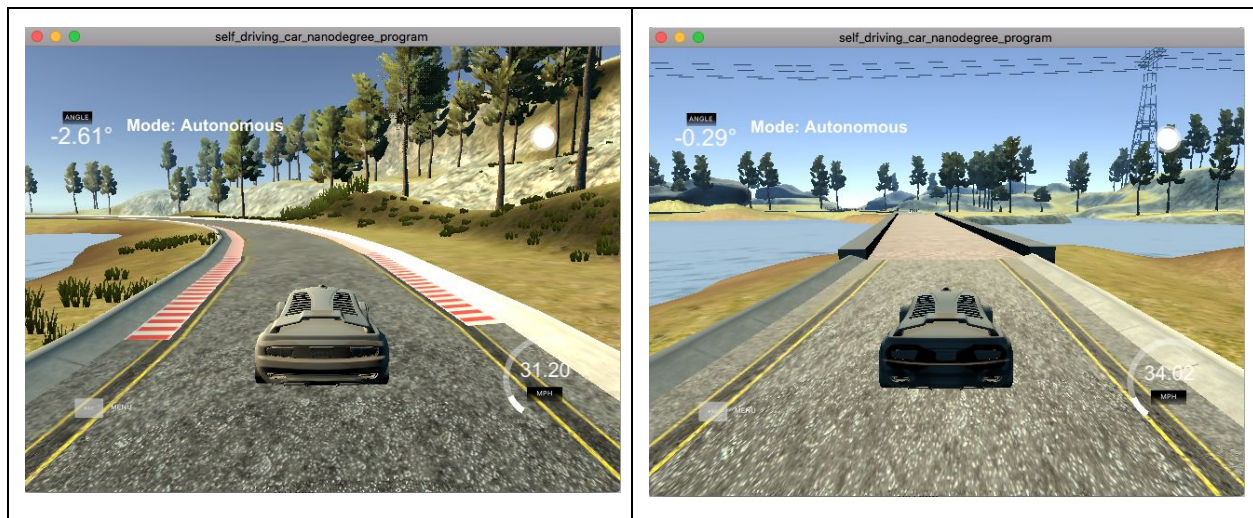
1. `./build.sh` - build project
2. `./clean.sh` - clean build folder
3. `./run.sh` - connect pid to Term2 simulator

Follows the correct algorithm

I completed todos in such files:

- `main.cpp`
- `PID.cpp`
- I also added `prev_cte` field to PID class in the `PID.h` file.

Results



Reflection

Mathematical form

The overall control function of PID controller can be expressed mathematically as

$$u(t) = K_p e(t) + K_i \int_0^t e(t') dt' + K_d \frac{de(t)}{dt},$$

where K_p , K_i , and K_d , all non-negative, denote the coefficients for the proportional, integral, and derivative terms respectively (sometimes denoted P , I , and D).

Roles of coefficients

- P is the proportional rate of error, we have to set this parameter due to the necessity of car must move between lane lines of the road.
- D is the derivative rate, it compensates overshooting and oscillation of proportional rate.
- I is the integral rate, if there is control bias it helps remove it.

The choice of the final hyperparameters

The P and D rates I took from lectures, it worked fine and I didn't change them. We don't need integral rate because our case is ideal and there is no any steer bias in the simulator.