UDACITY

PROJECT

Model Predictive Control (MPC)

A part of the Self-Driving Car Program

PROJECT REVIEW

CODE REVIEW

NOTES

SHARE YOUR ACCOMPLISHMENT!

Meets Specifications

Greetings Udacian,

This was an awesome submission which was clear enough to review. I must applaud the explanations in the writeup which were straight on-point and precise. Also your code is clearly organized and well commented. This shows a very high degree of seriousness and excellence in your work. Remain the brilliant student that you are and you can do more beautiful things. Bravo! ⭐

More insight on MPC can be obtained from the articles below

- MPC Based Motion Control
- Kinematic and Dynamic Vehicle Models for Autonomous Driving Control Design
- A New Nonlinear Model Predictive Control Algorithm for Vehicle Path Tracking
- MPC-Based Approach to Active Steering for Autonomous Vehicle Systems

Compilation

Code must compile without errors with `cmake` and `make`.

Given that we've made CMakeLists.txt as general as possible, it's recommend that you do not change it unless you can guarantee that your changes will still compile on any platform.

The code successfully compiles with `cmake` and `make` without any errors. 👍

Some C++ debugging tips to consider as a developer

Setting Cmake build type realease
setting CMAKE_BUILD_TYPE to debug
Understanding why CMAKE_BUILD_TYPE cannot be set

Implementation

Student describes their model in detail. This includes the state, actuators and update equations.

A very detailed explanation was added to the writeup file showing the various variables in the state vector, the actuators used and the different update equations used in model to update the state of the vehicle. Splendid work!

Student discusses the reasoning behind the chosen *N* (timestep length) and *dt* (elapsed duration between timesteps) values. Additionally the student details the previous values tried.

It be seen very clear from the writeup the choice of the final values and how they were arrived at.

A polynomial is fitted to waypoints.

If the student preprocesses waypoints, the vehicle state, and/or actuators prior to the MPC procedure it is described.

Great Work converting the waypoint coordinates to vehicle coordinates right before fitting the 3rd order polynomial.

The student implements Model Predictive Control that handles a 100 millisecond latency. Student provides details on how they deal with latency.

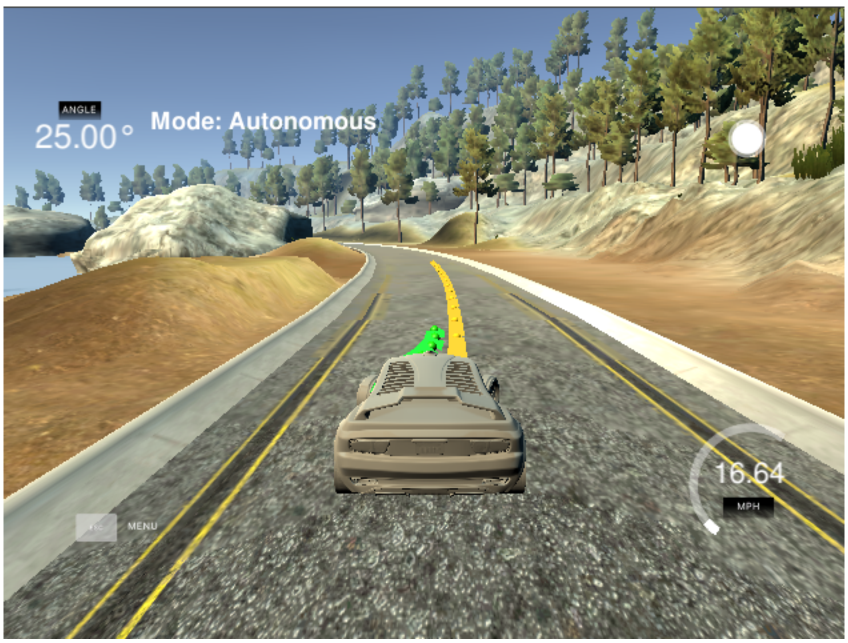
Great Job here implementing latency and explaining how it was dealt with by projecting the vehicle into the future before the model was called with the state.

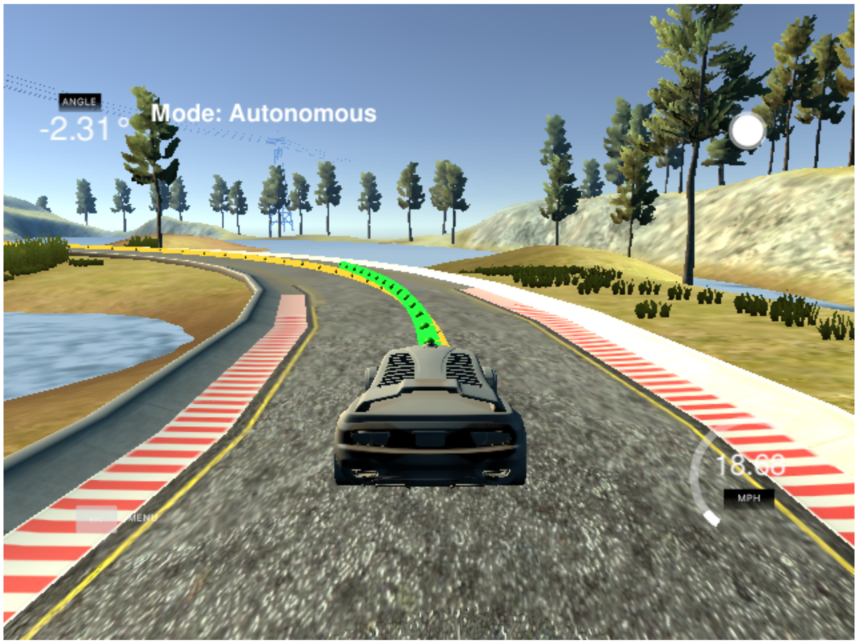
Simulation

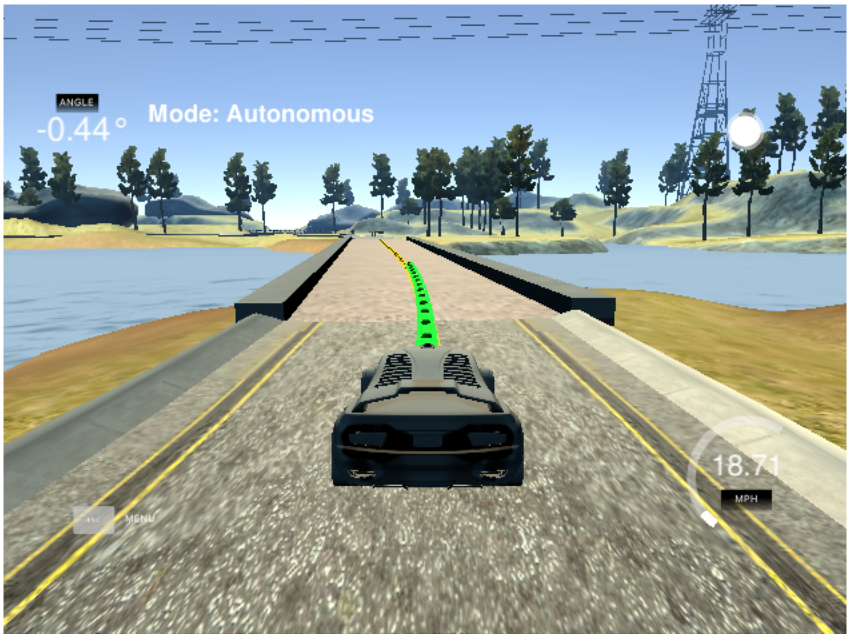
No tire may leave the drivable portion of the track surface. The car may not pop up onto ledges or roll over any surfaces that would otherwise be considered unsafe (if humans were in the vehicle).

The car can't go over the curb, but, driving on the lines before the curb is ok.

Excellent! The car drives smoothly without leaving the track even once. This is depicted from the images below:







DOWNLOAD PROJECT

RETURN TO PATH

Student FAQ