CarND-Path-Planning-Project WriteME

In this writeme, I am going to describe the source code I added to the main.cpp file.

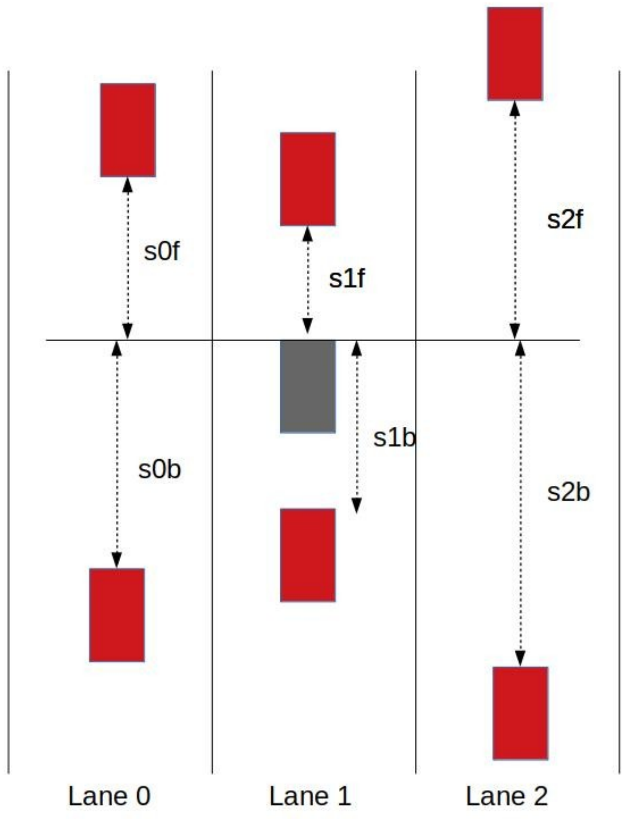
Two main functionalities are implemented, a cost function calculation and simple state machine.

Cost function calculation

First I collect information about the lanes in the driving direction. For each lane the following information is stored:

- Distance from ego to the vehicle ahead of the ego (sif)
- Velocity of the the vehicle ahead of the ego
- Distance from ego to the vehicle behind the ego (sib)
- Velocity of the vehicle behind the ego

The figure below shows one scenario along with distances described above.



Using that information, a cost value can be calculated for each lane as follows:

$$cost=\frac{1}{sif}+\frac{1}{sib}$$

note:

this formula applies when the speed of the ahead vehicle is greater than the ego speed

and the the speed of the behind vehicle is less than the ego speed.

Once the cost is calculated for each lane, the state machine can be applied to execute a lane change.

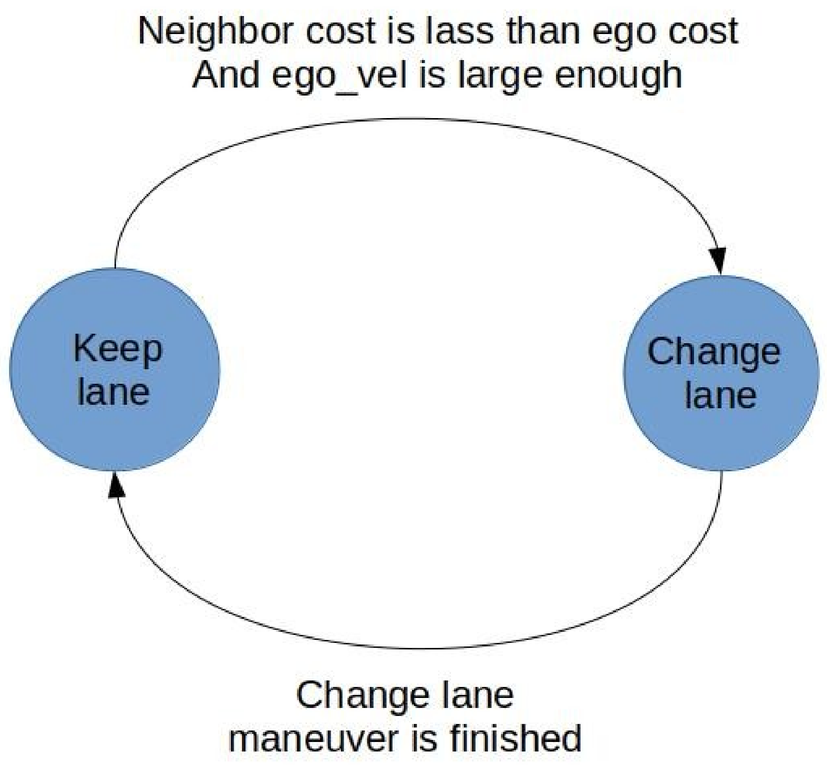
State machine

A very simple state machine was implemented. It consists of only two states; keep lane (KL) and change lane (CL). Here I did not distinguish left or right lane change.

The following figure shows the state machine diagram and how the machine transition from one state to the other.

The vehicle is first at the “KL” state, once the vehicle is moving(it starts at 0MpH velocity) and the cost of a neighbor lane is less than the ego cost, a lane change maneuver is executed and the state is set to “LC”. When in “LC” state, the vehicle stays in that lane until the predicted path is in one lane which means the maneuver is finished an it is safe to change lane again by setting the state back to “KL”.

The software was tested and the vehicle was able to drive more than the required distance with no collision or breaking of the Jerk or acceleration constraints.


Neighbor cost is lass than ego cost
And ego_vel is large enough
Keep lane
Change lane
Change lane
maneuver is finished