Path Planning - Reflections

In this project I have implemented what is called “finite machine”. in this implementation, there is a finite number of option, or paths, that the car can take, and we choose the one that is optimal - whatever we choose to optimize the behavior for.

This optimization can be done with a cost function, where we fine-tune the weights of his components.

Another approach is to manually define the behavior we want. this method is limited, and work well only in simple environments. given the relatively simple world in this project, I decided to use this method.

So, in the model I build, in every iteration the model is considering to change lane, either to the right or to the left (right_lane_clear = True, and left_lane_clear = True). and then the model is starting to rule out lane shifting when is not possible, not safe or without gain.

Cases of ‘not passable’: if the car is in the rightes lane - he can’t go even righter. same for left.

Cases of ‘not safe’: when there is a car in the destined lane, up to 10 meters behind the ego-car.

Cases of ‘no gain’: when there is no car that blocking the way, or when there is a car that blocking the lane in the destined lane.

In cases where the car is stuck behind another car with no option (or gain) to shift to another lane, the car will decelerate towards the speed of the car in front. the rate of the deceleration will be 1/10 of the difference between the speed of the ego-car and the speed of the other car. if the deceleration rate is too big (more the max acceleration), than the deceleration will reduce to the max acceleration, in order to avoid high values of jerk and acceleration.

The preference of not hitting a car over not feel jerk will naturally be contained in the cost function method, but since this project requires no jerks at all, I didn’t bother addressing that.

There are some cases when it’s clear that the model is not very efficient. for example, when the car is in the rightest lane, and there is a car that blocking the middle lane, but the left lane is free - an optimal policy will cause the car to slow down, wait for the car in middle to pass and slide into the left lane.