

# Steering Control for Autonomous Vehicle

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## Abstract

The objective is to design and implement steering control for autonomous car to reach its end point while avoiding collision with other static and dynamic vehicles. We are planning to use Q learning and deep Q learning for our task which enables the system to learn a more practical driving maneuver performed in real world.

We will start with ROS and Gazebo using Python programming language for robot simulation using our own custom robot. The robot will be a car like model with laser sensor to detect distances, odometer sensor for vehicle localization and other required sensors. The vehicle is our plant in a closed loop system which ensures proper maneuvering of the vehicle to achieve the designated task. The plant takes sensor data as input to localize itself in the environment and detect approaching vehicles. It has control variables in the form of steering angle, velocity and acceleration. The controller we are employing for steering control is Model Predictive Controller (MPC) which will control our vehicle using kinematic bicycle model.

First, using the distance sensor data recorded for a period of time, we can calculate distance and velocity of the approaching vehicles. Next, we will initialise our learning algorithm with Q value, which will generate a control signal after taking the sensor distance and velocity data as input. The control signal generated by the learning system is then fed into the MPC controller responsible to maneuver the vehicle in the environment. The algorithm will receive negative-reward if the vehicle collides with other vehicles or is not able to reach the goad. After a reasonable number of trials. the system will learn to achieve the task of reaching the goal point while avoiding collision with other moving vehicles.

Such system has huge potential in autonomous driving industry since it will play a major role in minimizing the number of road accidents. In addition to that, such system will help to reduce delays and travel times, so that, we can focus on the tasks that matters.