General Path Generation Model

1. All vehicles from sensor fusion data are checked and we are making a high-level decision to change lane (car_ref_lane) or speed (car_ref_vel).Factors influencing automobile decision-making include:

- There is car ahead, so we have to change lanes or slow down. (bool b_change_or_slow)
- Is there traffic blocking the left and right lanes so we can't change lanes and have to slow down?This also includes cars that are changing lanes, so there is a horizontal velocity component in the Frenet space. (bool b_cant_go_left and bool b_cant_go_right)
- Also, we do not change lanes if we are already in a right-most or left-most lane; we also don't perform a double-lane-change (checking b_changing_lanes) or a lange change below 20mph.
- Is the distance from the nearest car in front of us in the target lane greater than the distance from the car in front of us in our lane (by examining double min_dist_left, double min_dist_right and double min_dist_here).

2. A spline is constructed to sample new trajectory points from

- Its first control point is the last two points of the unprocessed/remaining path returned by the simulator.

- If the simulator does not currently return any points, start at the current vehicle position.
- On this basis, three control points are added, and the distance from the last point of Frenet space is 30, 60 and 90 meters.
- The spline control points are converted to vehicle coordinates, with x pointing forward, so the spline is a well-defined function with a unique x to y resolution for all x.

3. The spline is sampled to return the trajectory points that the path should follow.

- The spline first populates the unprocessed points returned from the simulator

- The spline is always sampled up to 30m ahead (`target_x_car`)
- The number of points sampled (and the distance between them) is determined by the reference speed, so that the car can cover the correct distance between the points of a trajectory every 0.2 seconds.