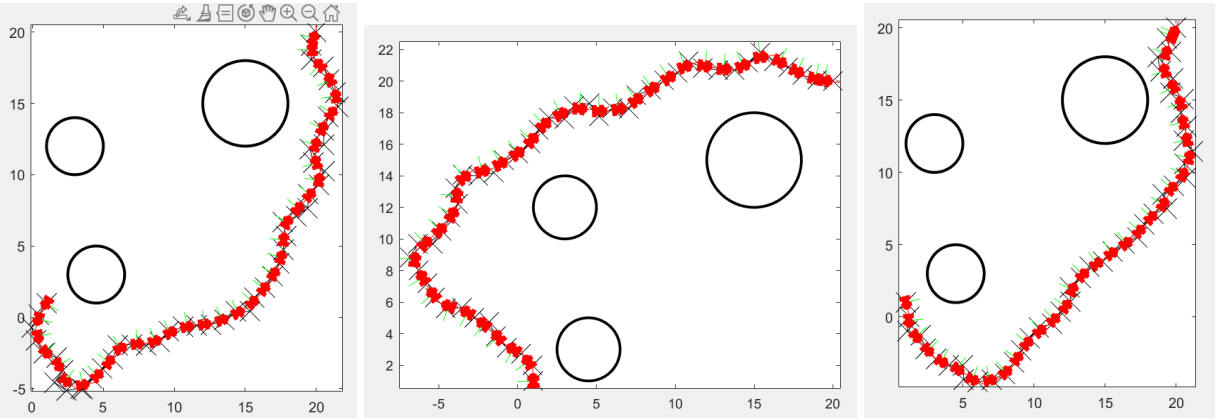
# README

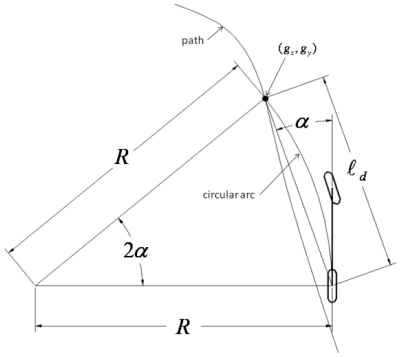
Upon using the Simulink ODE solver and implementing the bicycle trajectory planning algorithm, I came up with the following results:



The Xs depict the BiRRT path, and the red car describes the trajectory generated.

I first ran the BiRRT path planning algorithm script (question_1.py) and generated the .mat files for the path. This path was then used in the trajectory planning. This code can be reproduced by running the trajectory.m program.

In this algorithm, we feed the waypoints of the bicycle to the controller. It then uses the PurePusuit Algorithm to generate a trajectory. The pure pursuit method consists of geometrically calculating the curvature of a circular arc that connects the rear axle location to a goal point on the path ahead of the vehicle. It uses various properties to do so. [source]




Upon using this construct and considering the law of sines of a triangle, we get the following simplified expression for the trajectory.

$$\delta(t) = \tan^{-1}\left(\frac{2L\sin(\alpha(t))}{\ell_d}\right).$$

Here, δ(t) is the angle made by the axle of the bike's front wheels with the leading vector.

This code is implemented in MATLAB, which I used to get the above results.