1- I have studied the real roads. Here are some results. For Kuzey Marmara Otoyolu I have found technical specifications. Here the document states that the minimum radius of the road is 1000 meters and the road is designed for maximum speed of 120 km/h.

OTOYOLUN TEKNİK ÖZELLİKLERİ

Kuzey Ege Otoyolu, proje amaçları doğrultusunda uluslararası norm ve standartlarda üstün kalite performansı sağlayacak şekilde dizayn edilmiştir. Oto yapımının her aşamasında, uzman ekiplerin kontrolü altında test ve deney faaliyetleri gerçekleştirilmiştir.

Proje Hızı	120 km/h
Trafik Şeridi Genişliği	3,75 m
Trafik Şeridi Sayısı	2 x 3 adet
Refüj Genişliği	5 m
İç Emniyet Şeridi Genişliği	1 m
Dış Emniyet Şeridi Genişliği	3 m
Platform Genişliği	35,50 m
Maksimum Boyuna Eğim	4,00 %
Minimum Kurp Yarıçapı	1000 m

I also have found some calculations for typical roads and limits for vehicle speeds and turning radii.

Tasarım Hızı (km/h)	E_{max} (%)	f_{max}	Hesaplanmış Yarıçap (m)	Yuvarlatılmış Yarıçap (m)
20	4	0,18	14.3	15
30	4	0,17	33.7	35
40	4	0,17	60.0	60
50	4	0,16	98.4	100
60	4	0,15	149.1	150
70	4	0,14	214.2	215
80	4	0,14	279.8	280
90	4	0,13	375.0	375
100	4	0,12	491.9	490
20	6	0,18	13,1	15
30	6	0,17	30,8	30
40	6	0,17	54,7	55
50	6	0,16	89,4	90
60	6	0,15	134,9	135
70	6	0,14	192,8	195
80	6	0,14	251,8	250
90	6	0,13	335,5	335
100	6	0,12	437,2	435
110	6	0,11	560,2	560
120	6	0,09	755,5	755

Since I mostly consider highway scenarios I have picked my car's velocity as 100 km/h. Therefore minimum turning radius is 435 meters.

2- Tried to find a way to estimate DeltaX similar to DeltaY. This would help me to better generate path candidates. Not sure if it exists therefore researched the thesis and the references. The thesis directs to [60] and this paper directs to [16]. I couldn't find the exact equation. ChatGPT produces some results but I don't think those results are exactly implementable. I do not want to spend more time on it.

Papers:

Simple clothoid lane change trajectories for automated vehicles incorporating friction constraints [60]

Smooth Local-Path Planning for Autonomous Vehicles [16]

3- Tried to generate paths with exact final heading rather than generating a variety of curves by changing final heading. For this implementation the path lengths of curves are varied. Elementary curves are used.
The red path is the real path. (Radius = 490meters, Path Length = 98)
The result:

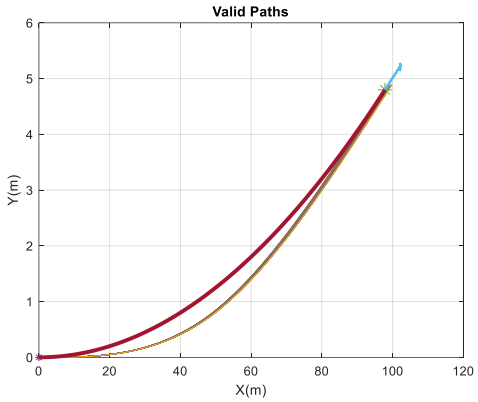

Figure 1: All paths

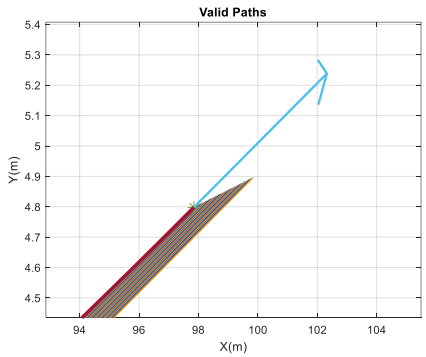

Figure 2: Close up to destination point

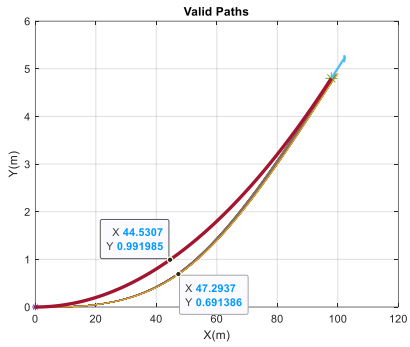

Figure 3: Data points at high deviation parts

All paths seem to reach to goal. However, as seen in Figure 3 the deviation is way too high. The vehicle leaves the lane if it follows the generated path. The first part and the final part of the generated curves seems to be okay. At this point I thought now may be the time to generate intermediate paths. I thought I could divide the road into a sensible number of subroads. Next section describes this procedure.

4- In this implementation the total path is divided to a number of segments. Number of segments should be varied according to path length. Information known about the road

consists of the curvature of the road and the requested path length. Considering real cases these information can be gathered. Again heading is not varied
For every segment 100 different path lengths are tried. After calculating the first segment the second segment's initial point is randomly selected between final points of first segment's path candidates and the procedure keeps calculating. Constant curvature is assumed therefore if the path calculation is successful for the first segment, the path calculation will be successful for second segment as well.
Red curve is the real path.
Here are the results:

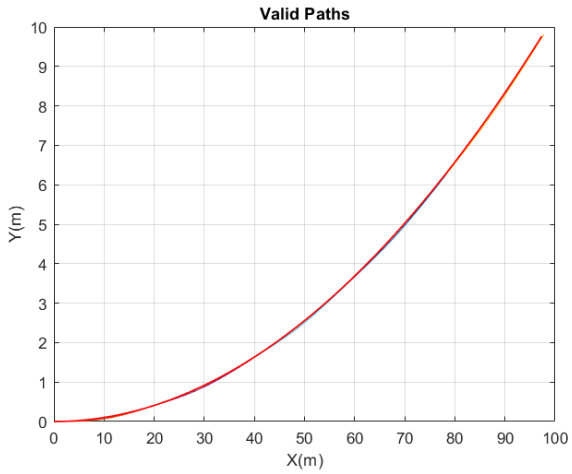

Figure 4:Overall result for 5 path segments

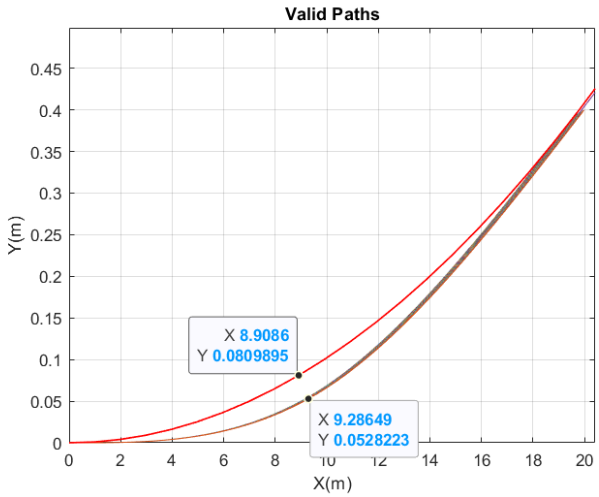

Figure 5: Close up to first segment of generated paths

Figure 5 show that the generated paths deviate from real road more than 50 centimetres. This performance is not acceptable since it would lead the vehicle out of the lane.

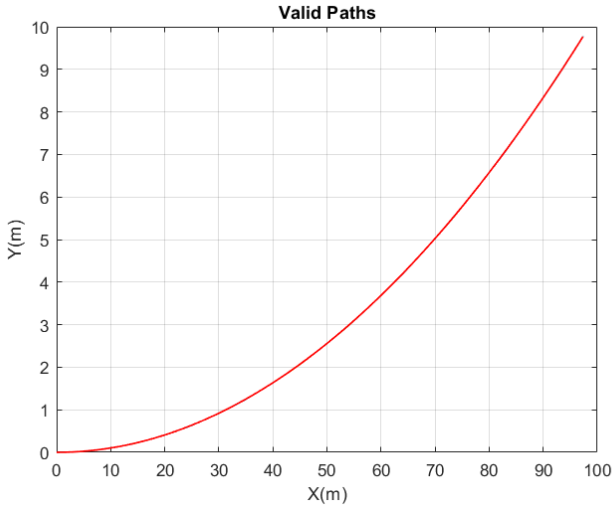

Figure 6: Overall result for 10 path segments

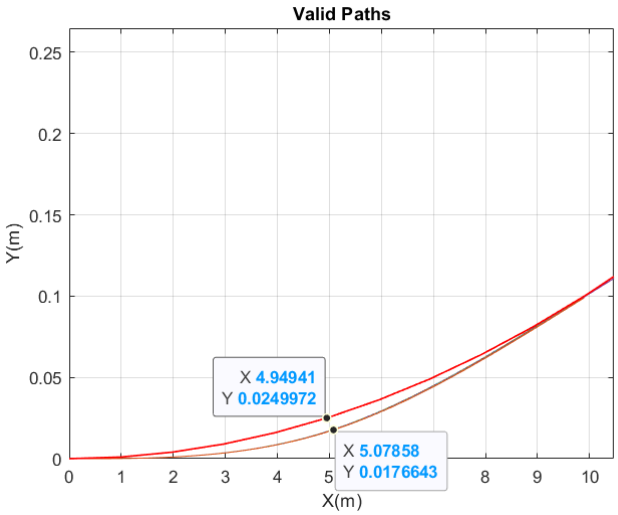

Figure 7: Close up to first segment of generated paths

Figure 7 shows that the deviation is around 10 centimetres. This performance is more acceptable.