

Polynomial curves: problems

1 Where do B-splines begin?

Compute the starting point of a B-spline curve of degree 1, 2, and 3 if its first three control points are P_0 , P_1 and P_3 .

2 Subdivision for Bezier curves

Using the notation from the Bezier subdivision class notes, verify that

$$B_{P_0 P_{01} P_{012} P_{0123}}(t) = B_{P_0 P_1 P_2 P_3}(t/2).$$

This means that first half (i.e. the section corresponding to the time interval $[0, 0.5]$) the Bezier curve with control points P_0 , P_1 , P_2 and P_3 moves twice as fast as the Bezier curve with control points P_0 , P_{01} , P_{012} , P_{0123} . Be sure you understand how this leads to subdivision for B-splines.

3 Properties of Bezier curves

Do planar Bezier curves with the following quadruples of control points:

Curve A: (-10,-1) (-1,0) (1,-3) (10,2)

Curve B: (1,10) (3,1) (-1,0) (0,-10)

intersect? (Hint: there is no need to compute the intersection, draw a figure and use the properties of Bezier curves)

4 Joining Bezier curves

Let $P_0 = (0, 0)$, $P_1 = (1, 1)$, $P_2 = (3, 4)$, $P_4 = (7, 9)$, $P_5 = (7, 12)$, $P_6 = (8, 10)$. Where can we put the point P_3 to ensure that the Bezier curves with control points $P_0 P_1 P_2 P_3$ and $P_3 P_4 P_5 P_6$ join smoothly (no cusps)?