CS 418: Interactive Computer Graphics Spring 2018
In-class Worksheet: Bezier Techniques

Bezier Curves

Cubic Bezier Curves

A Bezier curve is a parametric polynomial curve given by:

$$X(t) = (1-t)^3 b_0 + 3(1-t)^2 t b_1 + 3(1-t)t^2 b_2 + t^3 b_3$$

where b_i are the control points.

The tangent vector of the curve can be found by
$$X(t) = 3(b_1 - b_0)(1-t)^2 + 6(\dot{b}_2 - b_1)(1-t)t + 3(b_3 - b_2)t^2$$

1. **The de Casteljau Algorithm**
   Suppose our control points are

   b_0=(-1,0) b_1=(0,1) b_2=(0,-1) b_3=(1,0)

   Use the de Casteljau algorithm to find the coordinates of X(1/4). Check that you get the same answer from using the parametric expression given above.

2. **Tangents to a Bezier Curve**

   a. What are the tangents at the controls b_0 and b_3?
   Give the answer as a pair of parameterized functions.

   b. What is the tangent vector at t=0.25 for the curve given in question one?