Announcements

• MS1 tonight

• Class tomorrow in CF 420 - spline lab!
Goals

• Be able to derive the basis matrix for cubic Bézier curves.

• Understand why it's called the basis matrix

• Understand some geometric properties of Bézier splines:
  • Evaluation by linear interpolation
  • Subdivision and drawing using de Casteljau's algorithm
Beziers Curves: Demo

• https://celloexpressions.com/geometry/bezier-curves-splines/560.html

• or

• https://math.hws.edu/eck/cs424/notes2013/canvas/bezier.html
Why is it called a "Basis Matrix"?

• We have: \( f(u) = u^T B p \)

• For computational purposes, we'll want to precompute \( B p \).

  • This is the vector of \( a_i \)'s that weights each power of \( u \)

• How would we interpret \( u^T B \)?

  • A polynomial that specifies the weight on each control point.
Blending Functions
Cubic Bezier blending functions

\[ b_0(u) = (1 - u)^3 \]
\[ b_1(u) = 3u(1 - u)^2 \]
\[ b_2(u) = 3u^2(1 - u) \]
\[ b_3(u) = u^3 \]
Bezier Curves: Geometry
Coolest / most satisfying animation of the quarter

https://www.jasondavies.com/animated-bezier/