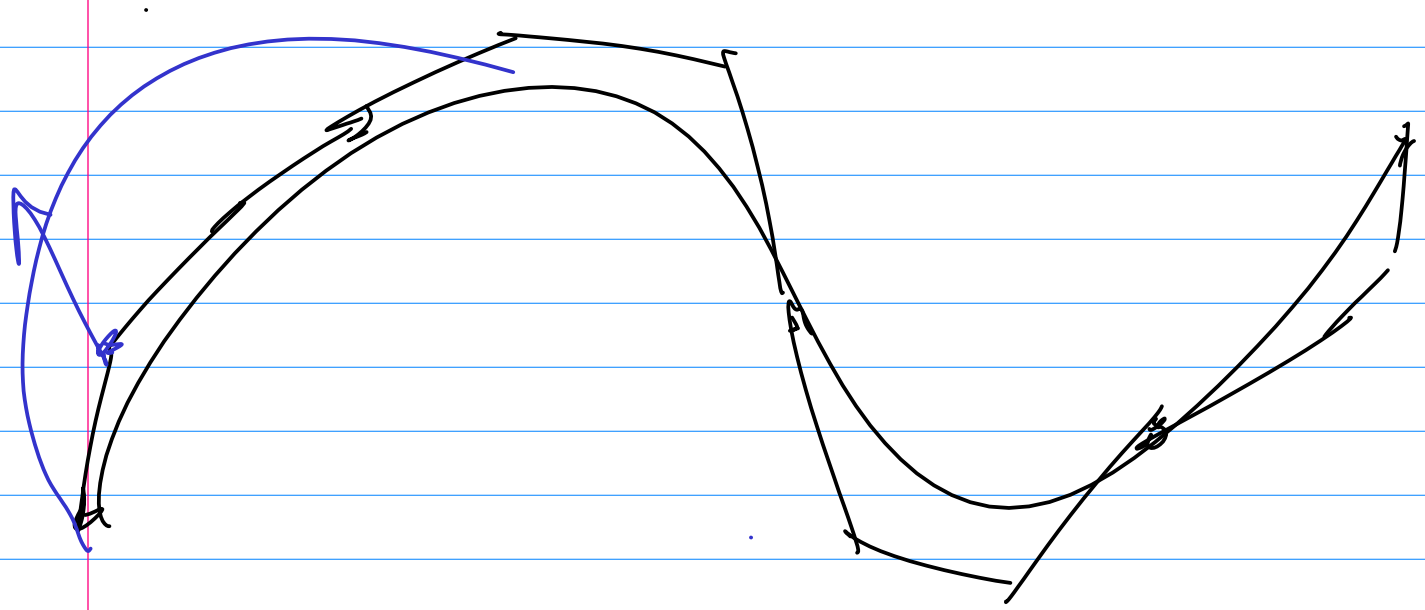
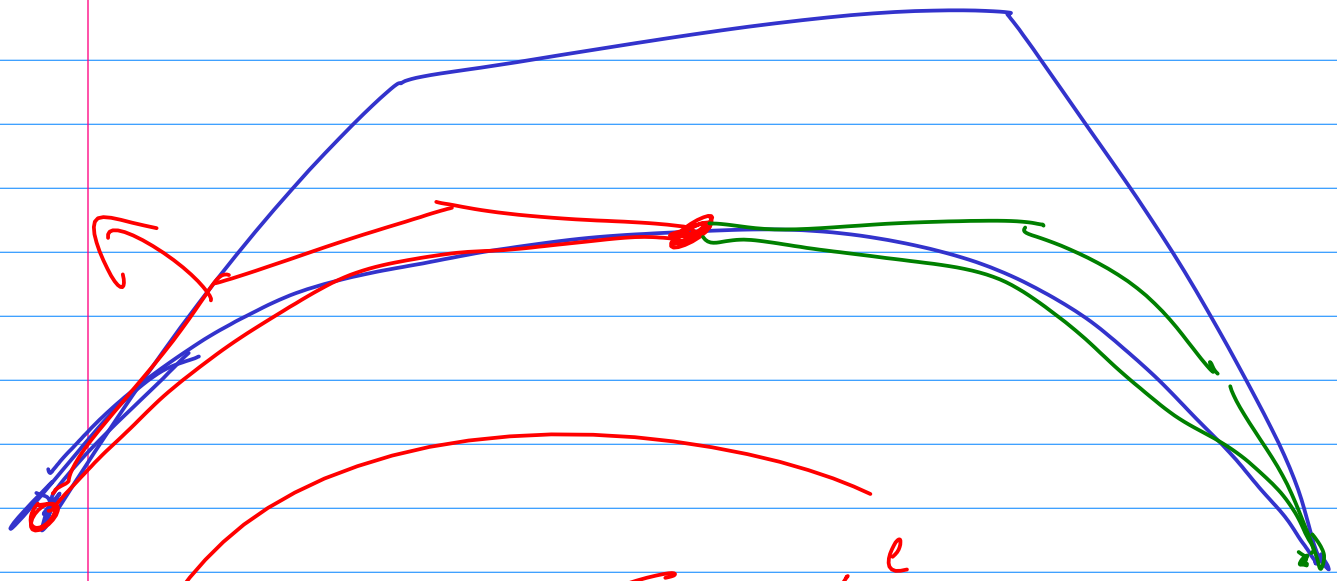
ECSE-4750 RPI
10/15/13 ctd



LOCAL CONTROL



$$x = \sum a_n t^n$$

$$y = \sum b_n t^n$$

$$z = \sum c_n t^n$$

2 → HOMOGENEOUS

$$\begin{pmatrix} x \\ y \\ z \\ w \end{pmatrix} \rightarrow \begin{pmatrix} x/w \\ y/w \\ z/w \end{pmatrix}$$

CARTESIAN

$$x_H = \sum a_n t^i$$

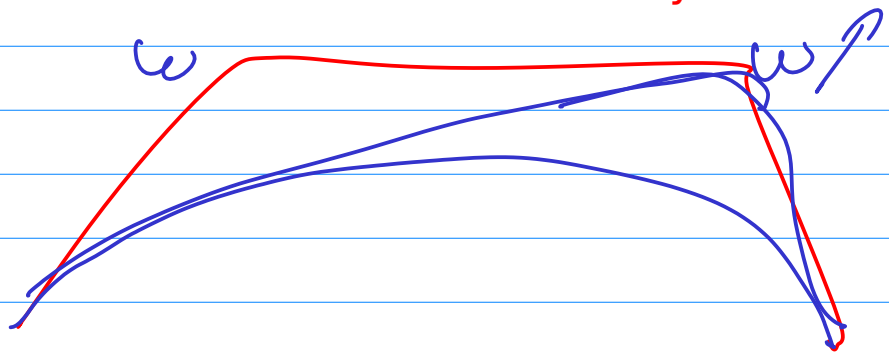
$$y_H = \sum$$

$$w_H =$$

$$x_C = x_H / w$$

$$y_C = y_H / w$$

This adds more d.f. What can you use it for?

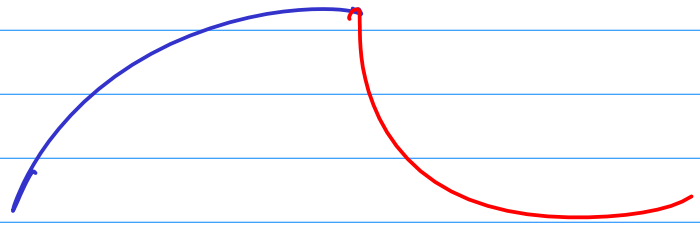


Designer can vary w to attract and repel the curve.
Bezier can now do an exact circle.
This works better with perspective projections.

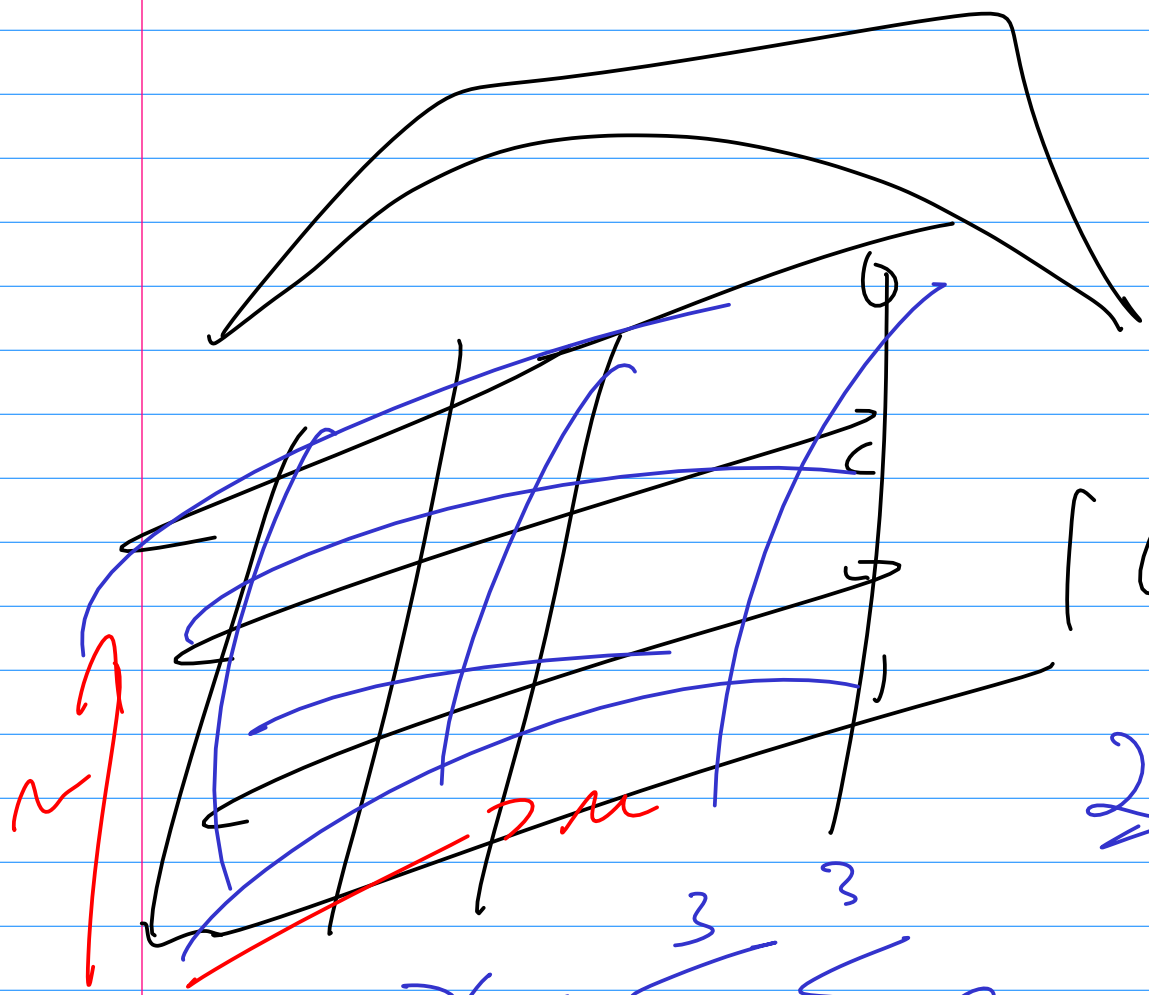
$$\left(\sum a_i t^i\right)^2 + \left(\sum b_i t^i\right)^2 = 1$$

With homogeneous coords, it's a RATIONAL spline.

We can make some control points coincide, to deliberately reduce continuity. -> NONUNIFORM



NonUniform Rational B Spline -> NURBS



$$x = \sum_{i=0}^{3} \sum_{j=0}^{3} c_{ij} u^i v^j$$

$$y = \sum \sum$$

$$z = \quad c_{ij}$$