

Art 484: Introduction to 3D Animation

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Schedule

- Roll
- First assignment.
- Lecture: 6 steps to computer animation
 - Bouncing Ball Demo

First Assignment

- Assignment A on the web site
 - www.umbc.edu/~mcdo/484/arA.pdf
- a fairly detailed object, made with NURBS
 - I suggest a car, airplane, or other manufactured item
 - if in doubt, please ask or email

NURBS are curves

- A way of taking four points and making a smooth curve between points 1 and 4.
- By adjusting points 2 and 3, you change **endpoint tangents**.
- tangent = the direction of a line at a particular point on the line



Curves are limited

- They can only have two turns
- If you want more turns, you need more curves
- Maya tools usually make lots of curves at once



Curves come in sets

- To join two curves, just put their endpoints in the same place.
- To make the curves join smoothly, make the endpoints and two tangents lie on a line



Curves have direction

- they are generated by a function
 - $p = f(t, p1, p2, p3, p4)$
 - $p1, p2, p3, p4$ are points
 - t is a parameter, $0 \rightarrow 1$ range
 - p is an output point
- to draw the curve, get lots of points for many values of t , then connect with line segments

surfaces from curves

- use a grid of points – rows and columns
- use the rows to make one set of curves
- use points on the first set to make a second set of curves
- two parameters now! u and v .
 - the rows are interpolated using u
 - the points from the rows with v
- every point on the surface has a u, v coordinate!

Consequences

- You always must use a grid of points
 - triangular shapes are awkward
- You don't have absolute control over the shape
 - even if you snap control points to positions
- Surfaces with areas of high and low detail are awkward
- Crinkles
 - many cv's right next to each other

advantages

- smooooooth. ness.
 - accurate modeling of low-detail shapes
 - models can contain less data
 - model can be easy to gracefully deform
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- some things are easier, some harder

vocabulary

- CV's = control vertices = the points that are interpolated = the actual model data
- patch = a grid of points used to generate a NURBS surface, OR the surface made from them
- isoparms = Iso-parametric lines = lines on the patch made of the points for which either u or v is constant