Non-linear Deformers
Maya 2012

Concept

• Most 3D programs offer a set of common deformation tools
  • For example: bend, twist, flare, etc.
  • Maya calls these “non-linear deformers”
  • You can apply one of these deformer to any object:
    • For example, a geometric primitive, a lofted surface
    • Even to a hierarchical group of objects

Bend

• >Create >Polygon Primitives >Cube
• In the Channel Box, >Inputs
  • adjust its parameters so that it is long and tall
  • and has lots of subdivisions in each direction
    • For example, subdivisions X,Y,Z = 4, 16, 4
    • You will need these subdivisions
      • to make the object bendable

• Maya’s non-linear deformers are found in the Animation module. So…
• > Animation

• Select your box object
• >Create Deformers > Nonlinear >Bend []
  • >Edit >Reset Settings
• Create
  • A straight-line curve appears inside the box
    • But there is no bending ?!
  • In the Channel Box, select the Input node, bend1
    • Change Curvature number, to make it bend
    • Change High and Low Bounds numbers to change the range
effected by the bend

Interactive Adjustment
• You can also interactively adjust parameters:
  • Method 1:
    • In the Channel Box, left-click on the name of the parameter – for
      example, Curvature
    • With the name highlighted, drag the middle-mouse button in one of
      the modeling windows
      • As you drag, the numbers for that parameter change,
        • and the object bends more or less
  • Method 2:
    • Select the Bend icon in one of the modeling windows
      • Or in the Outliner window
    • Hit the t key to get the “manipulator” icon
      • (If it doesn’t show up, try clicking on the bend1 word in the
        Channel Box
      • Click and drag on the blue dots on the manipulator icon to adjust
        the various parameters

Delete the Deformer
• If you want to delete the Bend deformation entirely
  • And go back to your original shape…
• Select the bend node
  • By selecting the curve in a modeling window
  • Or selecting from the Outliner or Hypergraph
• Hit the Delete key

Making a Deformation Permanent
• (If you deleted your Bend deformer
  • hit z to undo and bring it back)
• To make your deformations permanent:
  • Select the box object (not the bend deformer)
  • >Edit >Delete by Type >History
  • to delete its history node
  • The bend deformer is gone,
  • but the cube retains its bent shape
• Once you delete the construction history (Input node),
  • you can no longer modify the bend parameters,
  • because the bend deformer has been deleted

The Axis of Deformation

• Non-linear deformations take place about a specific axis
  • You may need to re-orient your object in order to align it with that axis

• Delete your box object
• Create another cube
  • Give it lots of subdivisions so it can bend smoothly
  • Scale your cube so it is flattened in the Z axis
  • (See the illustration on the left)

• Select your box
• >Create Deformers > Nonlinear >Bend
• Adjust the Curvature
  • Notice that the box bends about the Z axis
  • (Again, the illustration on the left)
• The Bend deformer always bends around the Z axis
• To make your box bend in the direction of its flatness,
  • you need to rotate your box
• Select the box
  • Not the bend deformer – the box
• Rotate the box 90 degrees around Y,
  • It now bends as in the illustration on the right, above)

**Twist**

- Make another long, tall cube, again with lots of subdivisions
- >Create Deformers > Nonlinear >Twist []
  • set to default settings
- Adjust parameters of the Twist deformer
  • Change *Start Angle* and *End Angle*
    • These are the rotations at top and bottom of the model
  • *Move Low Bound* up
    • To remove the twist at the bottom

**Flare**

- Allows you to taper a model at top or bottom
  • With the four *Flare* parameters
- And also to bulge it positively or negatively in the middle of the model
  • With the *Curve* parameter

**Sine**

- Creates a sinuous Sine wave-form deformation of your model
  • *Amplitude* is how big the wave’s crests are
  • *Wavelength* is how many crests there are in a given space
Squash

- Squashes an object
  - Squashing in the vertical directions
  - While expanding around the middle
  - Like “squash and stretch” in animation
  - *Factor* controls how much squashing

Wave

- Creates a circular pattern of waves
- Works best for flat, horizontal objects
- *Amplitude* and *Wavelength* parameters same as in Sine

Moving the Model

- With a model deformed
  - by one of the nonlinear deformers…

  - Select your geometry
  - Translate it off to the side
  - !? it deforms as it translates
    - This is because the deformer did not translate with it

  - Undo the translation of your geometry

  - Select both the geometry and the deformer
  - Cntrl-g to put them into a group
  - Now translate the group
    - Everything behaves correctly
Deform a Hierarchical Model

- Create a hierarchy of simple objects
- Select the top node of the hierarchy
- Create a non-linear deformer on it
  - Adjust parameters
  - The entire hierarchical object is deformed