I. Boolean Operations and Trimming Surfaces

A. Constructive Solid Geometry - Allow you to join several objects in various ways and produce a single piece of geometry. Generally only works in solid modeling applications.

i. Addition(union) - Creates a surface by adding the two(or more) surfaces together.

ii. Subtraction(difference) - Creates a new surface by subtracting one surface from another.

iii. Intersection - Creates a surface based on the areas of overlap.

iv. Booleans in Maya

a. Boolean operations in Maya generate new surfaces by duplicating objects and applying trim curves based on the Boolean type.

b. All operations can be found under **Edit Surfaces -> Booleans ->**

c. Resulting surfaces are grouped together under a Boolean node in the Hypergraph.

d. Surfaces can be separated by moving shape nodes lower on the hierarchy.

e. Individual surfaces can be ungrouped and untrimmed, returning them to their previous state.

v. Maya Workflow

a. Create two objects and place them so they overlap at a point.

b. Select **Edit Surface -> Boolean -> Union Tool**.

c. Select the first group of objects that will be joined, and hit Enter. Then select the second object and hit Enter.

d. A new grouping is in the Hypergraph, and the previous object nodes are hide from view.

B. Curves on Surfaces - used to perform trimming, aligning, animation and other tasks.

i. Projection Curves on Surfaces

a. Projects a curve onto and through a surface. Good for cutting surfaces.

b. Maya Settings

1. Project Along - determines the way the curve is projected onto the surface.

2. Active View - projects the curves onto objects along the axis of the current view.

3. Surface Normal - projects the curve relative to the surface normal of the object, allowing you to re-project the curves onto other objects in the view.

c. Workflow - Select the curves to project, then the surfaces on which they will project.

ii. Intersect Surfaces

a. Finds the common edge between two intersecting surfaces. and creates curves on either the first or both of the surfaces.

b. Excellent for creating new surfaces. Poor Man's CSG.

c. Maya Settings

1. Create curves for - determines surfaces to create curves on.

2. Curve Type - determines the type of curve generated by the intersection. (3D World curves can not be used for trimming, as they do not lie on the surfaces after intersecting).

d. Workflow - Select the surfaces to intersect, order is important.

iii. Surfaces as Construction Planes

a. **Modify -> Make Live** - will turn a selected object into a construction plane.

b. You can then draw curves directly onto the surface of an object.

c. **Modify -> Make Live** to turn make the surface normal again.

d. You can edit the curve on Surface in the Attribute Editor.

C. Trimming Surfaces - Unlike Boolean operations which generate new surface area, trim operations simply cut a surface. They don't create new surface area.

i. Trim Tool- The surface still remains one surface, however the trim operation simply hides the portion you have selected for discarding.

a. Select surfaces you wish to trim.

b. In the **Trim Tool** dialog, select Keep or Discard, to set the selection tool for the trim operation.

c. Shrink Surface - if toggled on the underlying geometry shrinks to just cover the retained regions.

d. Select the surfaces you wish to Keep or Discard, then hit Enter.

ii. Untrim Surfaces- is the sister function to trim. It untrims discarded sections from surfaces that have been trimmed.

II. Fillet Surfaces - lets you quickly create an object with rounded edges, or blend two surfaces together.

- A. Freeform Filleting
  - i. Select two curves on surfaces, isoparms, or NURBs.
  - ii. Then **Edit Surfaces -> Surface Fillet -> Freeform Fillet**
- B. Blend Filleting
  - i. Select curves on surfaces, isoparms, or trim edges.
  - ii. Then **Edit Surfaces -> Surface Fillet -> Blend Fillet**
  - iii. If the blend surface shows up dark, reverse the normals of the curve on the first surface and/or last surface.
    - a. Use the Attribute editor to edit the Blend Fillet.
    - b. or, Click on the circular icon over the diamond on the two curves starting and ending the fillet.
  - iv. Blend surfaces are dependent on the generating surfaces used to create it.
    - a. Moving a blend surface will remove construction history.
    - b. Moving the surfaces on either side of a blend causes the blend surface to change, while continuing to hold the surfaces together.
    - c. Used mostly in models that require flexible joints.
- C. Round - Lets you create either circular fillets or variables fillets along edges of an object.
  - i. Select the edge of two overlapping surface curves. (Maya will highlight the overlap and create a profile for rounding).
  - ii. Select Radius and drag until you find the appropriate setting.
  - iii. Hit Enter to finish the rounding.

III. Model Sheets - excellent guide document for any modeling project.

- A. Generally used to represent standard character positions, expressions, and views.
- B. Can also be used to specify views of objects before you model them.

IV. Maya Interface Help

- A. Help Line
  - i. All important tool directions are given in the **Help Line** at the bottom of the Maya Window.
  - ii. To show or hide any part of the standard UI, use the Options Menu at the top of the Maya Window. **Options -> Help Line** will hide/show the help line.
- B. Pain and Main Menu bars can be toggled on or off using the Hotbox Controls menu in the Hot Box. Then dragging down to Window Options ->.
- C. Attribute Editor
  - i. Used to change parameters for all nodes in Maya.
  - ii. Upstream and Downstream connections - allow you to move through dependent nodes.
  - iii. Node Tabs allow you to quickly change to another node in the world for editing.
  - iv. Many attributes are also available for editing in the Channel Box.