

Week 3 Lab

IAT 343: Animation

Fall, 2012

Kyung Jae Lee (kla8sfu.ca)

Due date change

(9/23) Midnight Sunday

- **Team:** Script, team website, & sketch with description (character & environment sketch)
- **Individual:** individual website (just a link to your site).

(9/30) Midnight Sunday

- **Team:** Storyboard with pitch
- **Individual:** Post your Lab Exercises (week 1 – 3) on individual website.

Script, Character & Environment Sketch Examples (Due 9/23)

- http://www.sfu.ca/~bva7/cave_man_janitor/
- http://www.sfu.ca/~yca50/IAT343/stuckOnMars/html/story.html#character_sketch
- <http://iat343teamnameless.weebly.com/character--environment-concepts.html>

Here are some examples for Team sites

(<http://www.sfu.ca/~jpw3/iat343/team/index.html>)

(<http://www.sfu.ca/~jla194/fall10/343/teamjas.html>)

(http://www.sfu.ca/~yka34/IAT_343/team_site/)

Class Resources

- Maya documentation:
 - Access through Maya application: Help > Learning Resources > Tutorials >
Or go to
<http://download.autodesk.com/us/maya/2011help/index.html>
 - Online including tutorial files
(<http://usa.autodesk.com/adsk/servlet/index?id=9502844&siteID=123112&linkID=9242256>)

Theory & Training

Modeling Methods (CG Techniques)

•**Solid object**

•**Non-solid object**

1. Surface modeling (e.g., NURBS method)
 - Lofting (profile curve & path)
2. Polygon modeling
3. Constructive Solid Geometry (CSG)
 - Boolean algebra
4. Physically-based modeling
 - Mass-Spring Model (e.g. cloth)
5. Volume visualization
6. Procedural modeling
 - Particle system
 - Fractal system
7. Image-based 3D construction
8. Other approaches

1. Curve-based Surface Modeling



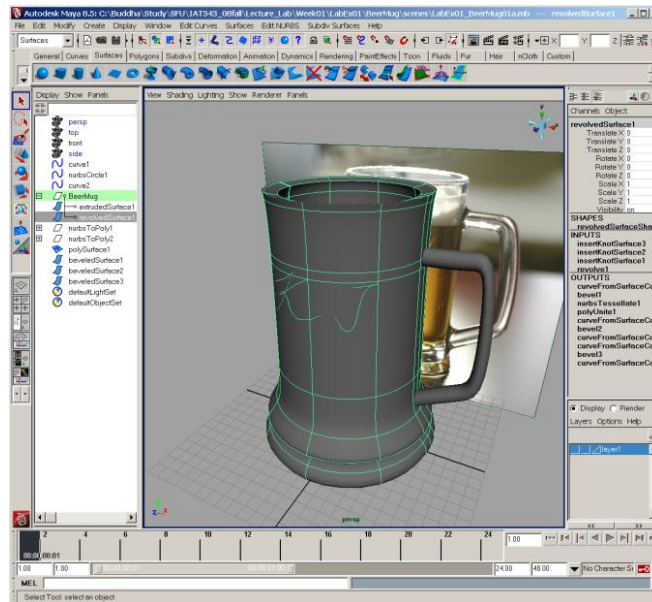
Source: ikea.com



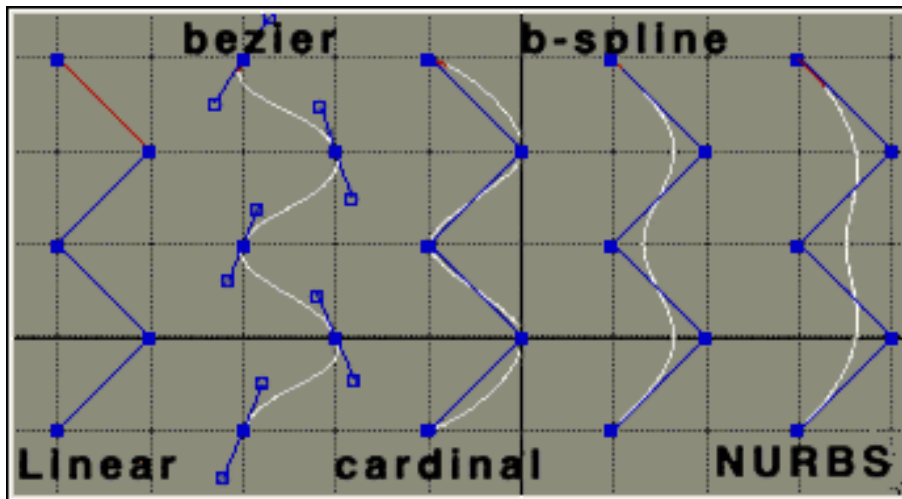
Source: Starbuckscoffee.net



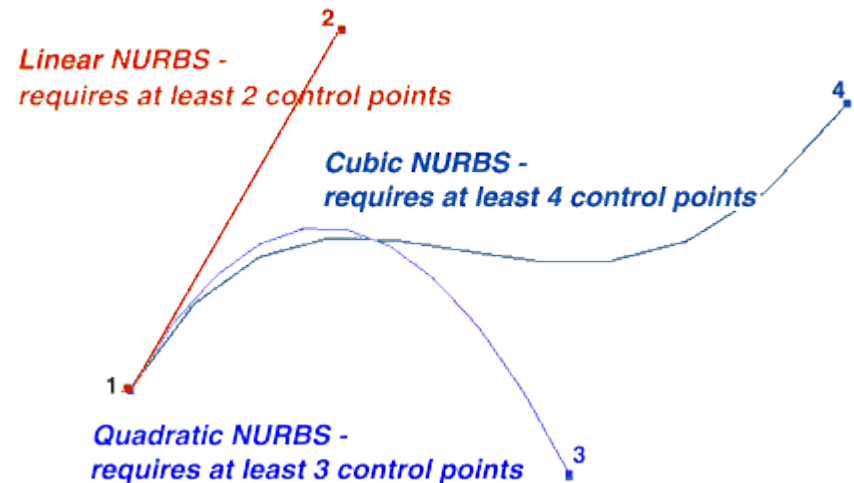
Source: Wedding-Favours.ca



Curved based modeling (parametric curved surfaces) contains mathematically defined elements and each coordinate is a function of one or more parameters such as a control hull, control points, tangent points, knots, and weights (Kerlow, p117 & p139-140).



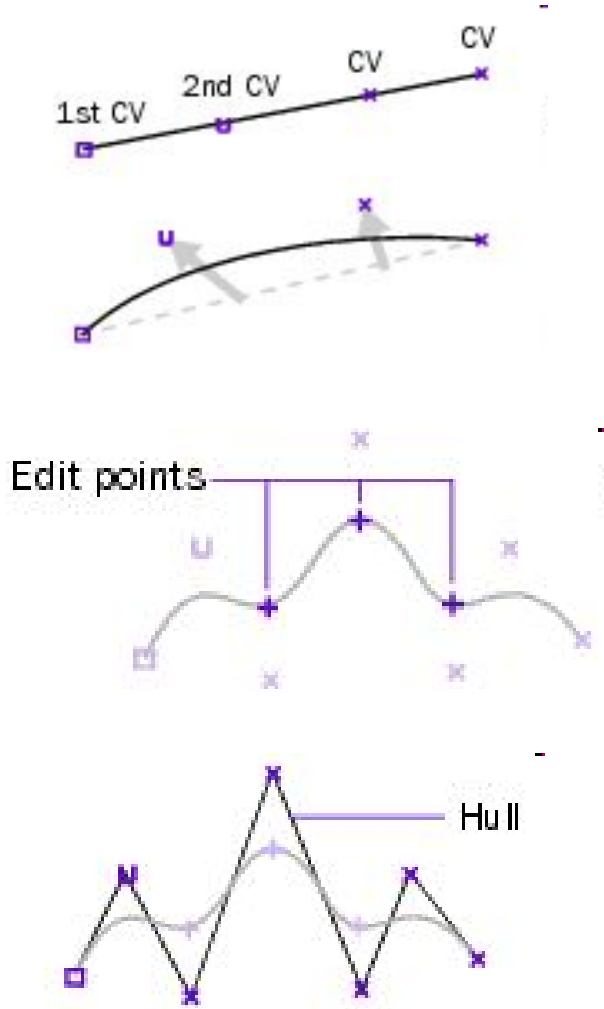
NURBS Curves of Different Degrees



Source:

http://www.erimez.com/misc/Softimage/tutorials/si_help/introduction/si_uk_model_intro.htm

Components of NURBS curves

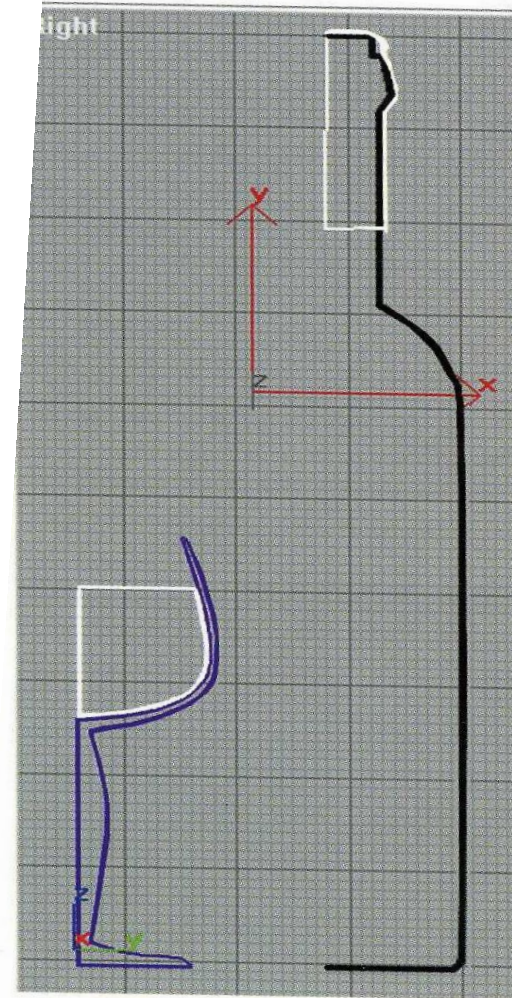
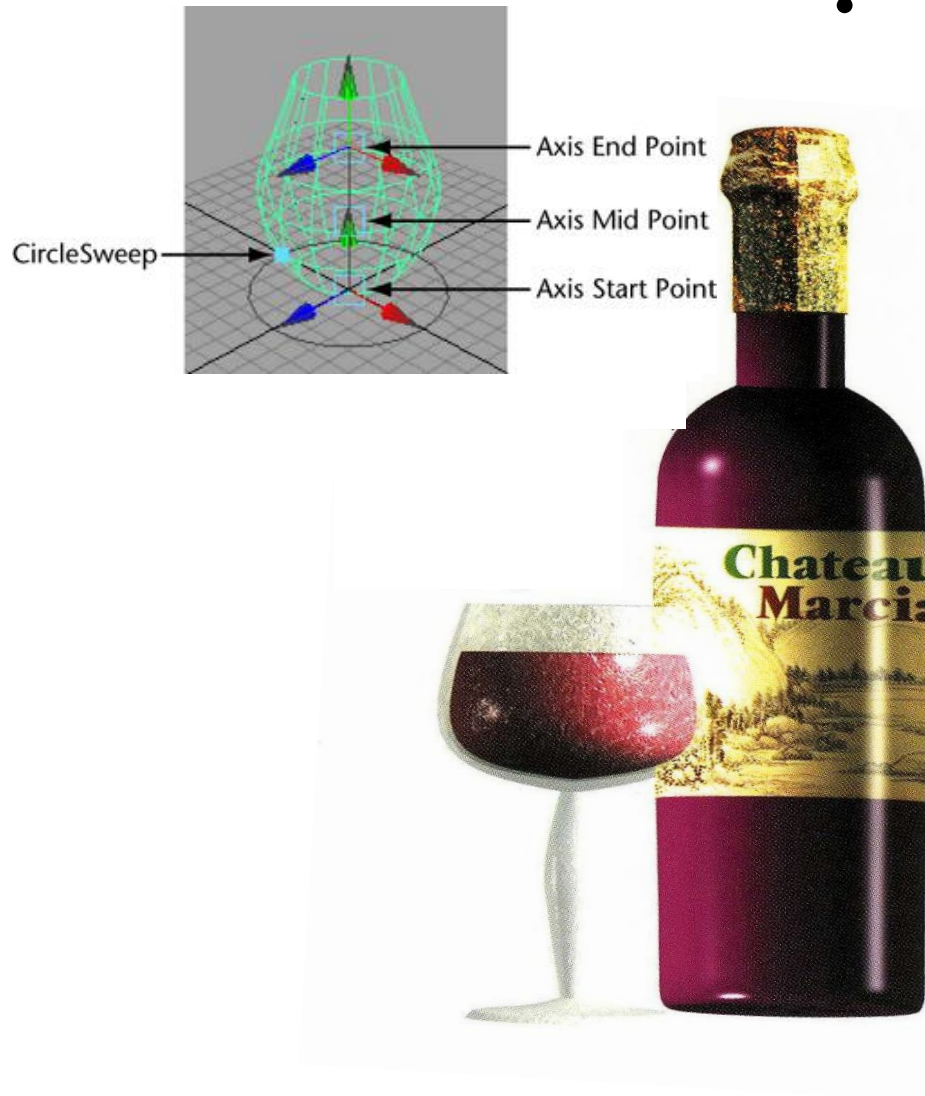


- **Curves**

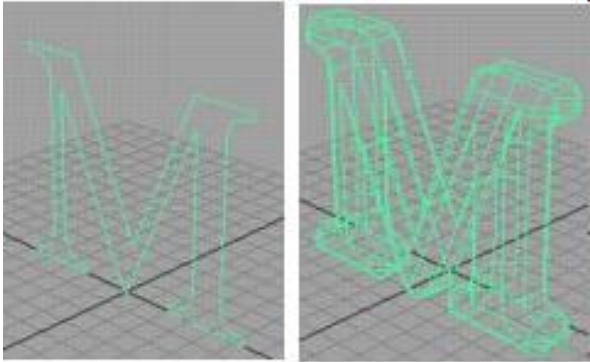
- CV (control vertices)
 - CVs (*control vertices*) control how the curve is “pulled” from a straight line between edit points. (1: box, 2: ‘U’ and the rest: dot)
- EP (edit points)
 - Connection points (small ‘x’ in Maya)
- Hulls
 - Lines between CVs
- Isoparms
 - Lines along the surface
- Patches
 - Enclosed area by four adjacent isoparms

- **Revolve technique**

- Sweeps out a surface by revolving a profile curve around a pivot point.

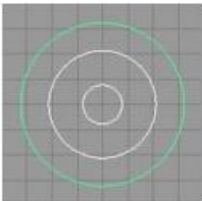
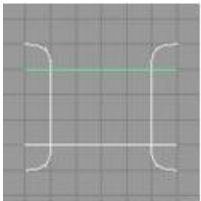


Surface Modeling

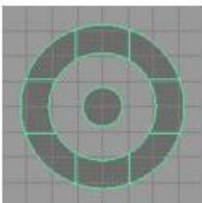
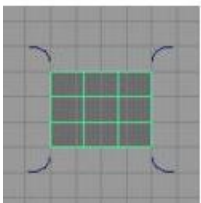


Surfaces > Bevel

Creating an extruded surface with a beveled edge from any curve, including text curves and trim edges.



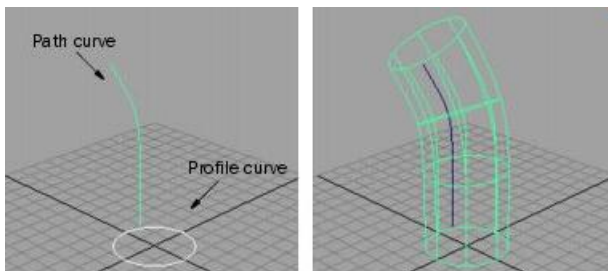
Original curves



Planar trimmed surface

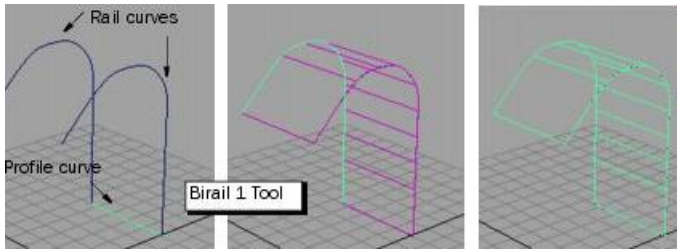
Surface > Planar

Creating a planar (flat) surface within a boundary curve.

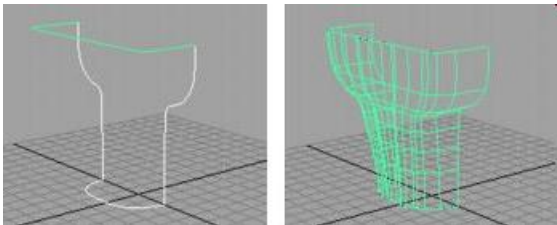


- Surface > Extrude

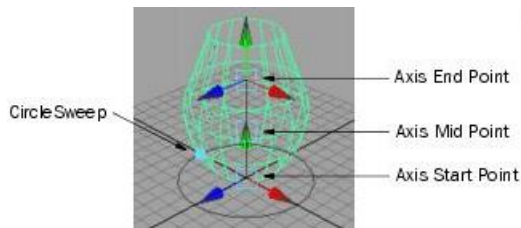
Modeling



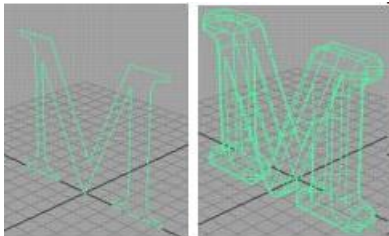
- Surface > Birail



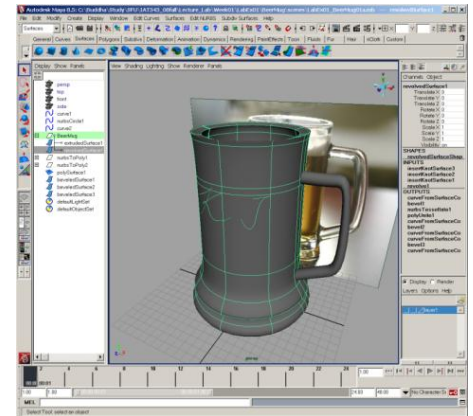
- Surface > Boundary



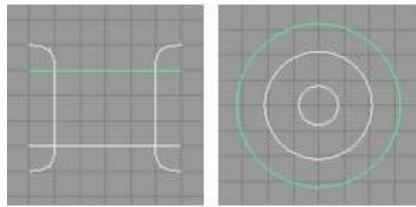
- Surface > Revolve



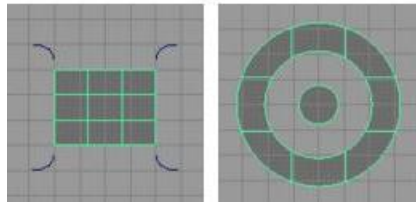
- Surface > Bevel



Surface Modeling

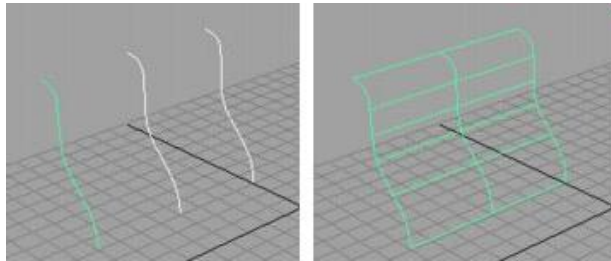


Original curves

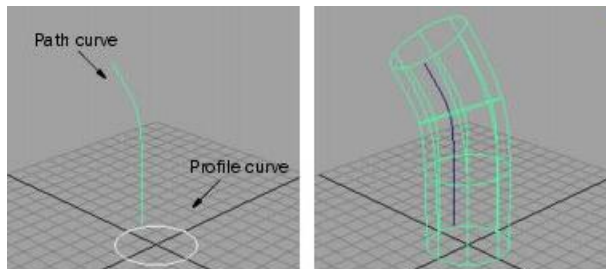


Planar trimmed surface

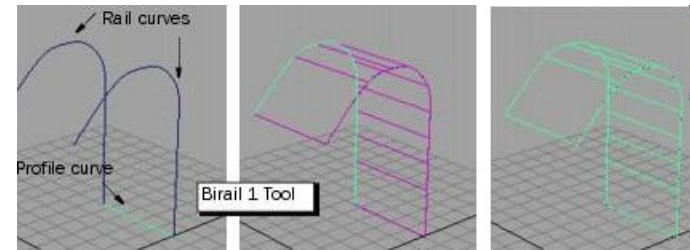
Surface > Planar



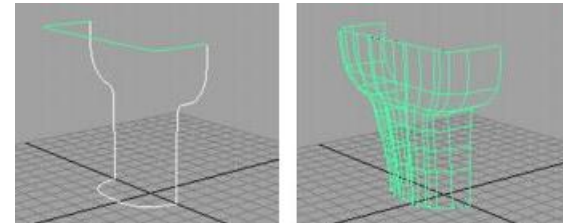
Surface > Loft



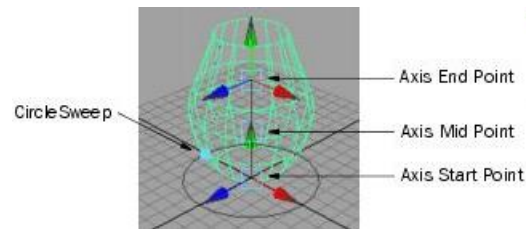
Surface > Extrude



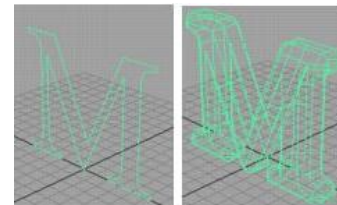
Surface > Birail



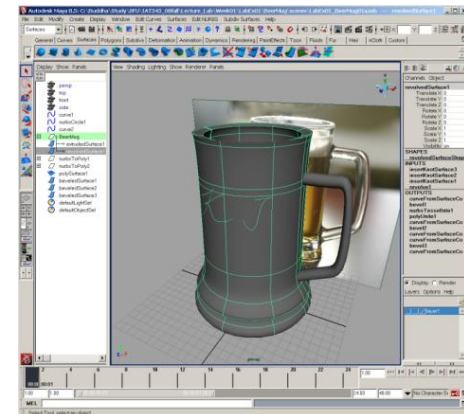
Surface > Boundary

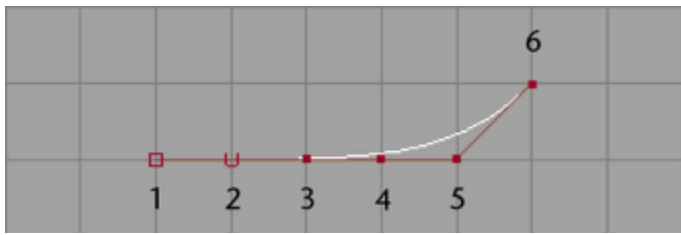


Surface > Revolve



Surface > Bevel



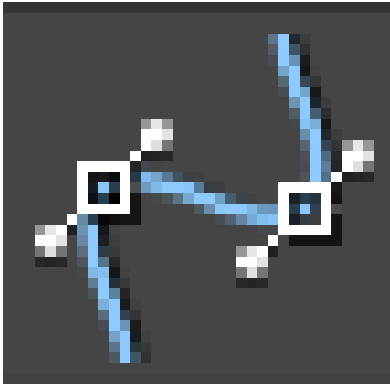


Creating NURBS curves

User Guide > General > Basics > Basics
Menus > Create > Create > EP Curve Tool

User Guide > Modeling > NURBS Modeling >

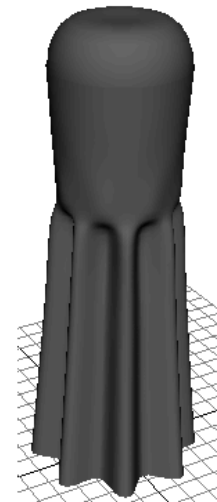
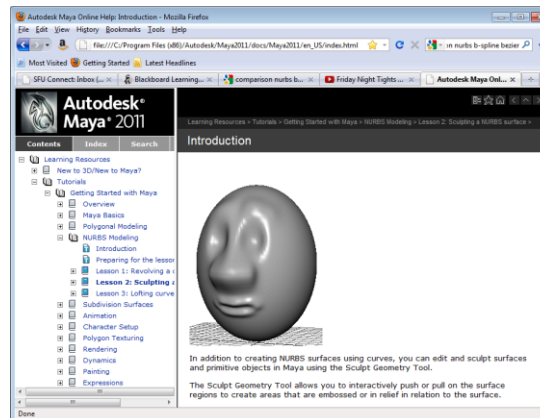
Creating NURBS curves



Topics in this section

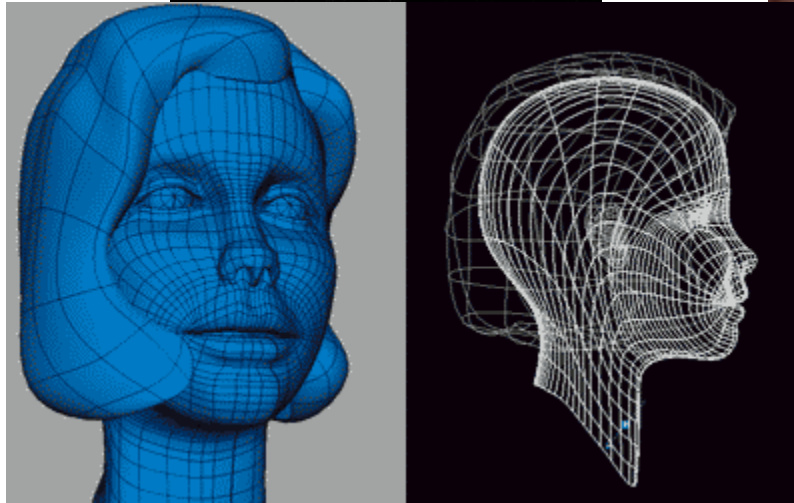
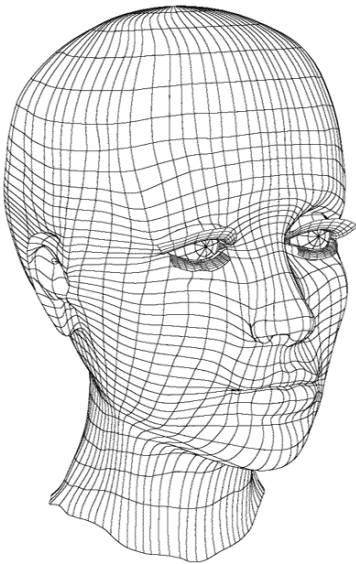
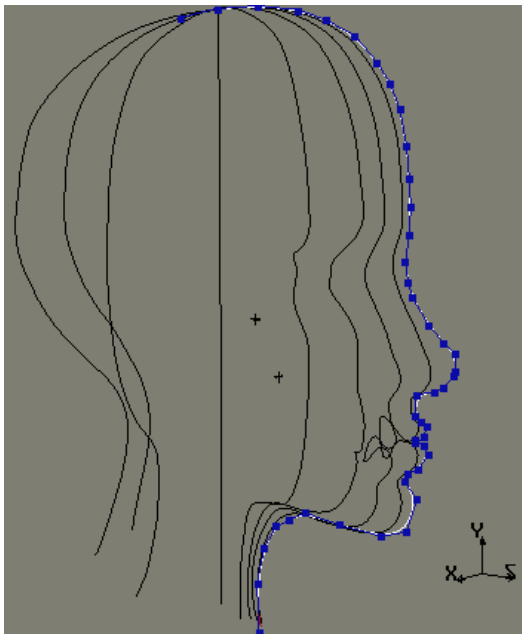
- Draw curves
- Create a curve from a surface edge, isoparm, or curve-on-surface
- Create a Bezier curve
- Create arcs
- Create a fillet curve between two existing curves
- Create a degree 3 curve to match degree 1 (scan) data

Learning Resources > Tutorials > Getting Started with Maya >
NURBS Modeling



Face Modeling Techniques

Curve/surface based: NURBS



Lab Exercise 3.1: Cookie Cutter

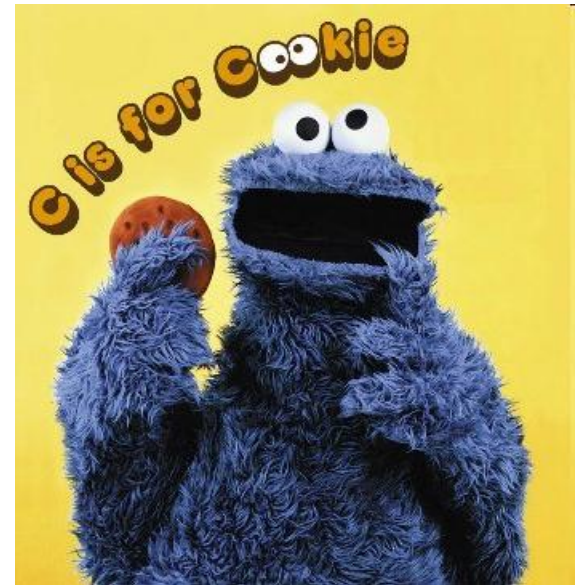
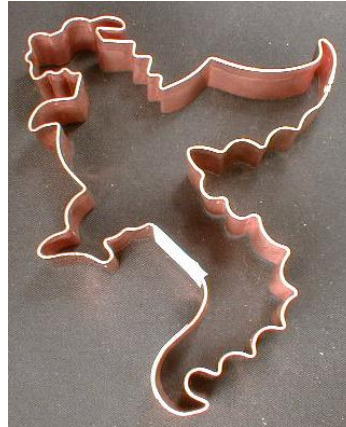
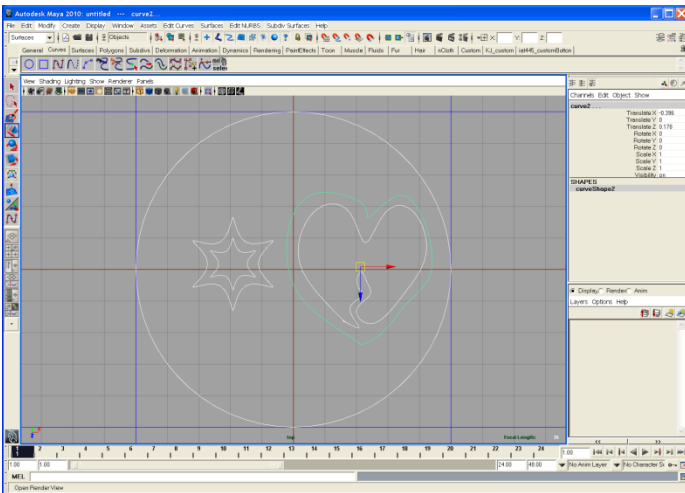
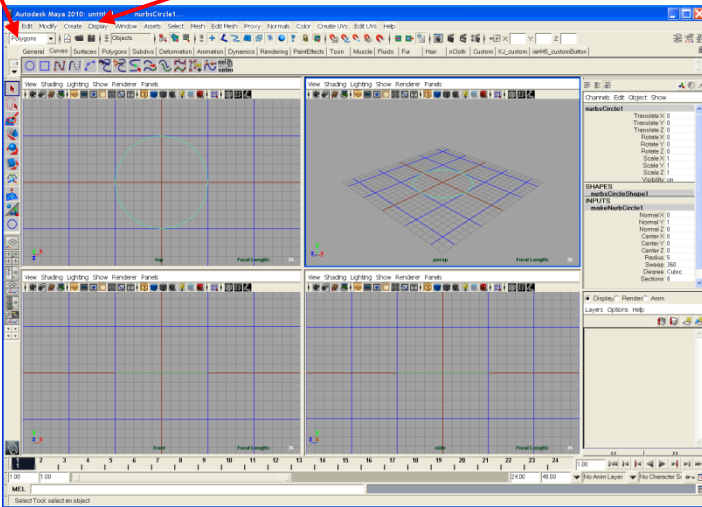


Image source:

- http://fantes.com/images/8205cookie_cutters.jpg
- <http://www.geekalerts.com/tag/cookies/>
- <http://www.thegreenhead.com/imgs/abc-cookie-cutters-3.jpg>
- <http://www.amazon.com/Childrens-Cooking-Kits-Cookie-Cutters/dp/B000TGQOLE>

Surfaces main menu

Create > NURBS Primitives > Circle

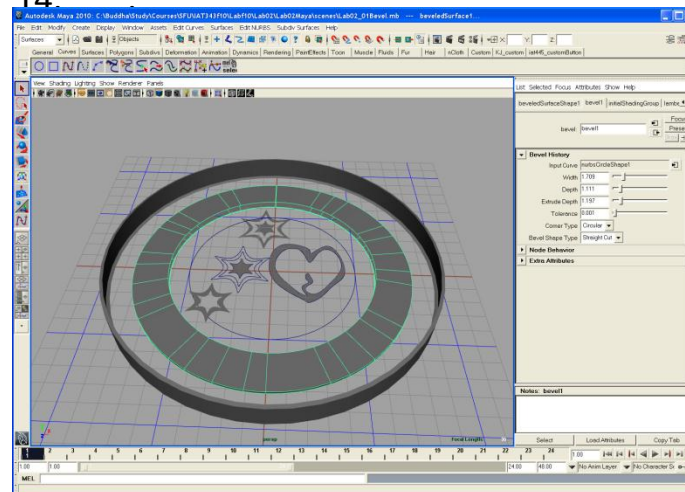
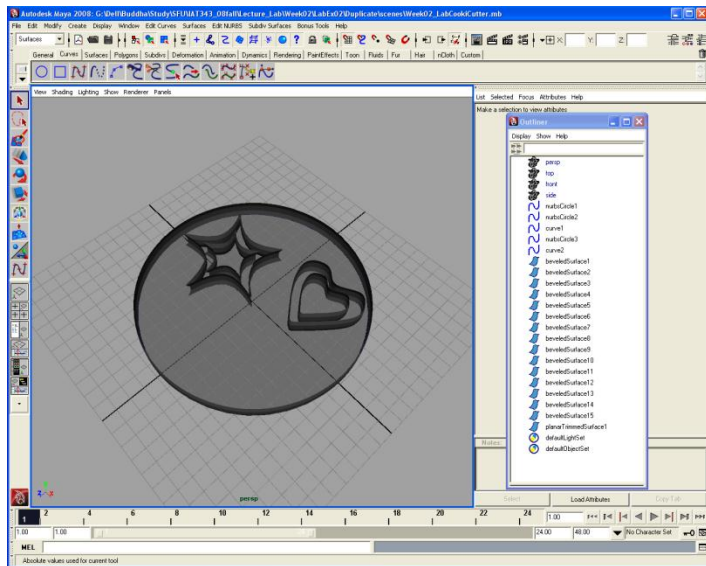
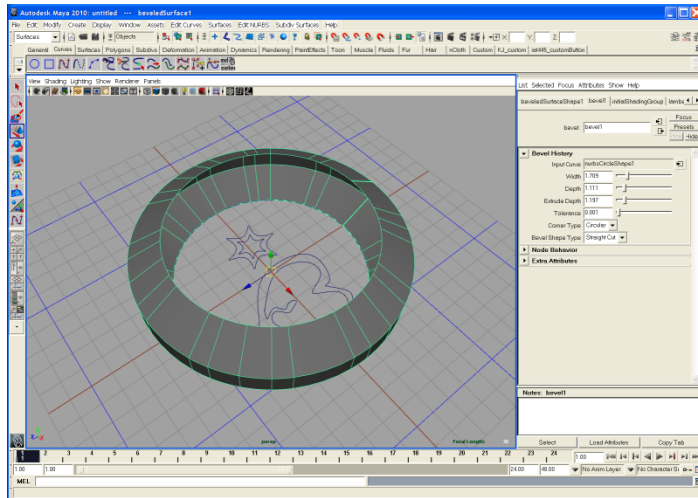


Lab Exercise 3.1: Cookie Cutter

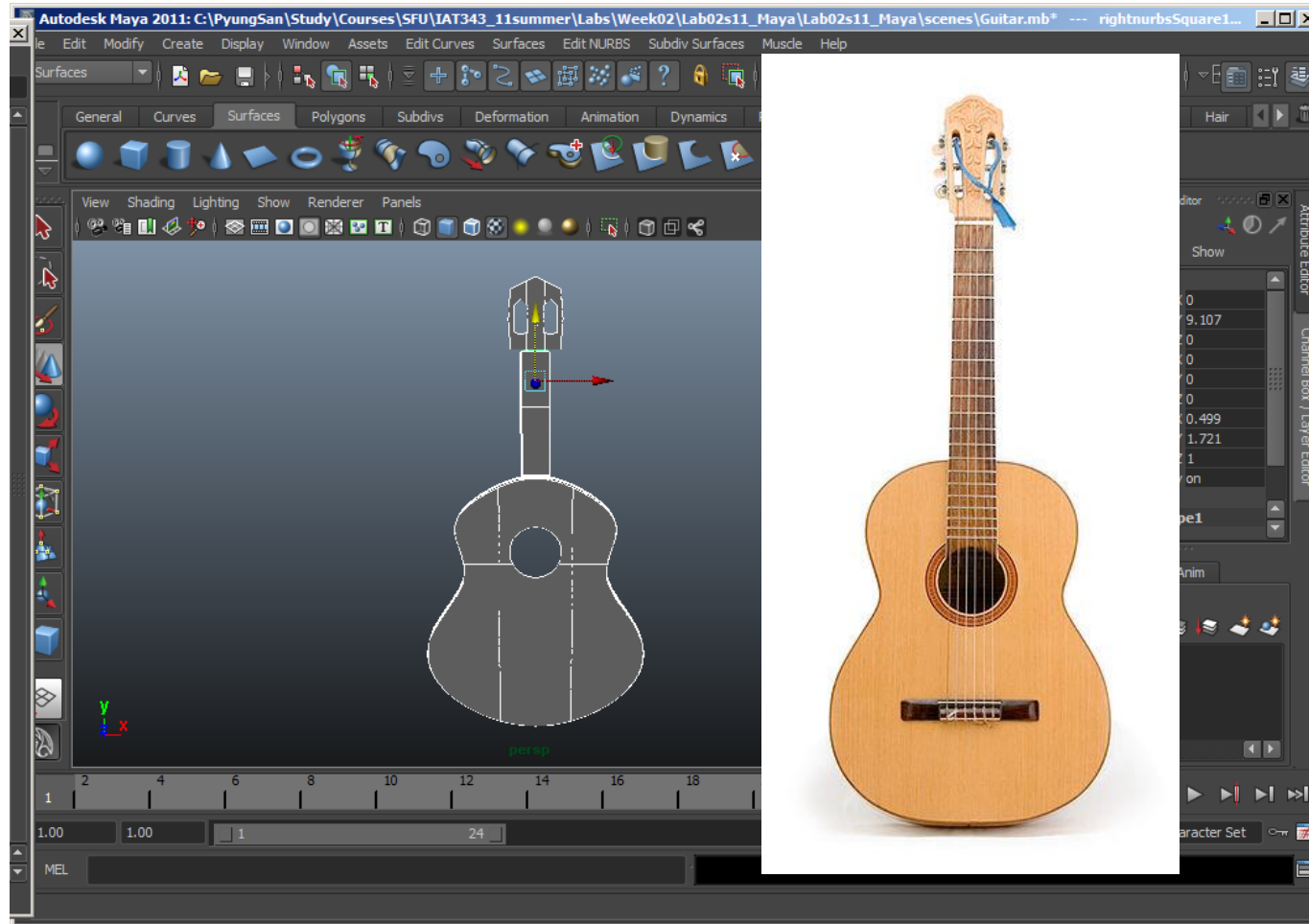
Outline curves, Planar & Bevel

1. First, switch to **Surfaces** main menu. Using the **Top** orthographic view, draw a circle: **Create > NURBS Primitives > Circle**. By holding 'x', we can snap on the grid.
2. On the right side of UI, click on the label under **INPUTS > makeNurbCircle1** on the **Channel Box** and change some parameter values (e.g., radius, sweep etc). If the Channel Box is not shown, click on the **Show or hide the Channel Box / Layer Editor**.. Add more circles and place them inside the first one.
3. To change the number of points on the circle, change **Sections** value under the **makeNurbCircle1** under **INPUTS**. To see the change, switch to the component mode (press 'F8' switch between the object and component)
4. To manipulate the shape of the circle (through the circle's components: points), RMB click on the circle and select the **Edit Point**. After selecting multiple points while holding the **Shift** button, use the transformation tools (**Move**, **Scale** or **Rotate**) to change the shape.
5. Instead of using simple circle tool, add/draw a number of shapes (i.e., heart, star) through the curve tool (**Create > EP Curve tool**). Select the new shape and make it sure the shape having a closed space (**Edit Curves > Open/Close Curves** under **Surfaces Module**).
6. Use the transformation tool to refine the shape. Pressing '**Delete**' reduce point(s), but also slight changes on the overall shape. Check the center point whether repositioning of the pivot point is necessary (**Modify > Center Pivot**)

7. Switch to the **perspective** view (bring the mouse cursor in the target view, hit the spacebar to maximize the viewport).
8. To extrude a surface from the curve, select the curve(s) and apply **Surface > Bevel**. Open an Attribute Editor (**Ctrl + A**). Click on the **bevel1** tab and adjust some parameter values (i.e., **Width**, **Depth**).
9. To see the list of the objects, go to **Windows > Outliner**. We can rename by click/type on the current text.
10. To create a flat surface from curve(s), select the curve(s) and apply **Surface > Planar**. Compare different results whether selecting single or multiple curves.
11. Using the **Outliner**, select the newly created surface (i.e., **planarTrimmedSurface2**) and adjust its position.
12. We can reuse the curves to generate another 3D surface.
13. Save your file '**yourLastName_initial_3_1.ma**'.
- 14.



Could we build a guitar based on previous exercise?



Source:
http://en.wikipedia.org/wiki/File:Guitar_1.jpg

To improve your modeling skills, read these chapters (review the syllabus)

Week 1

Introduction to Animation & Modeling

Reading:

☐ Kerlow: Ch 2 (p49 – 90) &

Ch 3 (93 – 114),

☐ Xiang ch 1(p1-5) & ch4 (p68—77)

Week 2

Modeling II & Scene Composition

Reading:

☐ Kerlow: Ch 4 (p115 – 138)

☐ Xiang: ch6 (p114-118), ch 7 (128-133) &
ch 9 (p174-178)

Lab Exercise 3.2: Curves & Surface Modeling



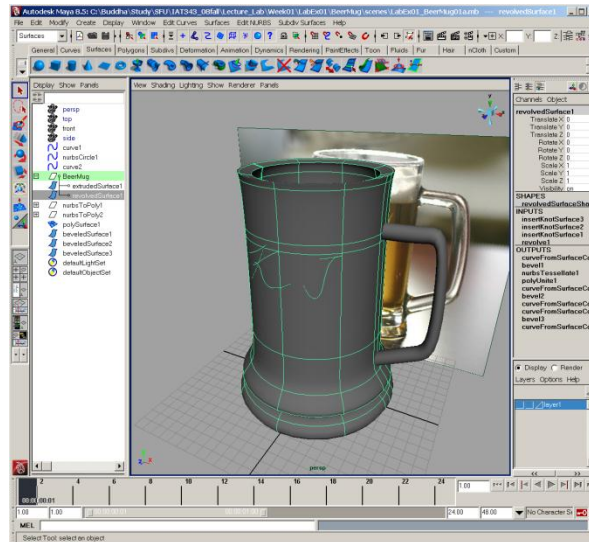
Source: ikea.com



Source: Starbuckscoffee.net



Source: Wedding-Favours.ca

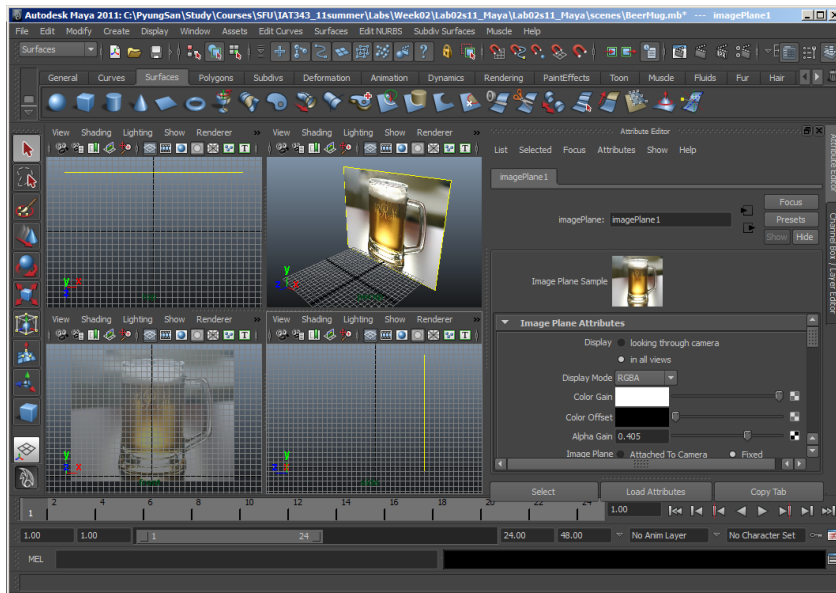


Ex 3.2. Curves & Surface Modeling (Beer Mug)

Step 1: Display a reference image



1. Create a new project (File > New Project) and generate subfolders through pressing the **Use Default** button. Save your file first (**File > Save Scene As** , select the **Maya binary**). Open a web browser and find a reference image (i.e. glass) ,or download the image, '**beer_mug.jpg**', from the Week 2 folder. Save it under the **sourceimages** sub-folder.
2. To display the image in the **Front** view window, apply **View > Image Plane > Import Image** function in the **Front** view menu. Select the saved image.
3. To adjust the position of the reference image in the virtual space, open an **attribute editor** of the currently selected object (Open it through either accessing **Display > UI Elements > Attribute Editor**, or go to the **View > Image Plane > Image Plane Attributes > select imagePlane1** in any viewport menu.
4. Adjust the position of the image by changing parameter values (x, y or z coordinates: e.g., 0.000, 11.000, -10.000) of the **Center** in the **Placement Extras** section.
5. Making the reference image semi-transparent (**Alpha Gain** value), it makes easier to build 3D geometry.



Step 2: Create an outline curve and construct a surface

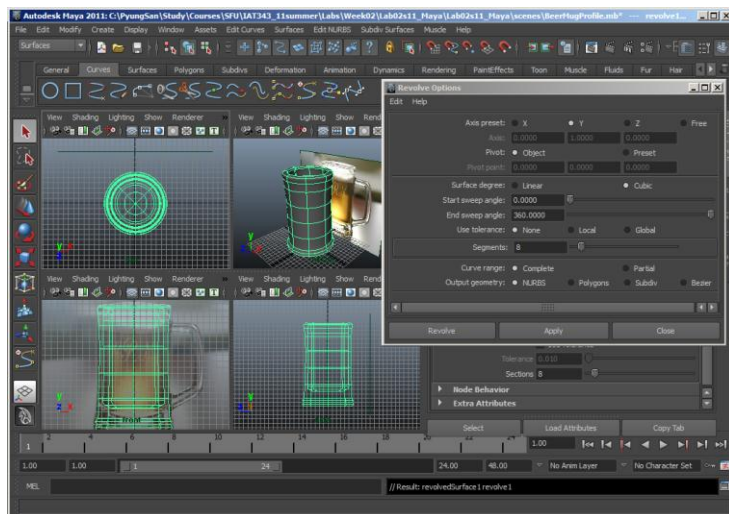


6. To draw an outline curve of the beer mug, switch to '**Surfaces**' module (press F4 key).

7. Before generating points for the outline curve, review the curve tool options through **Create > EP Curve Tool > Option Box**. Instead activating the straight curve (**1 Linear**), select the **Curve Degree** as **3** cubic for the smooth curve.

8. Using an orthographic view (**front**), draw a curve which shapes the outline of the half of the cup. To snap a point to the grid cell, press and hold '**x**' key while drawing.

9. To refine the shape of the surface, click and hold RMB (right-mouse button) and select either **Edit Point** or **Control Vertex**. Using the **Move** Tool, reposition an individual vertex to reshape. By pressing '**Delete**' key, erase an unnecessary vertex. Also, press '**z**' for undo.

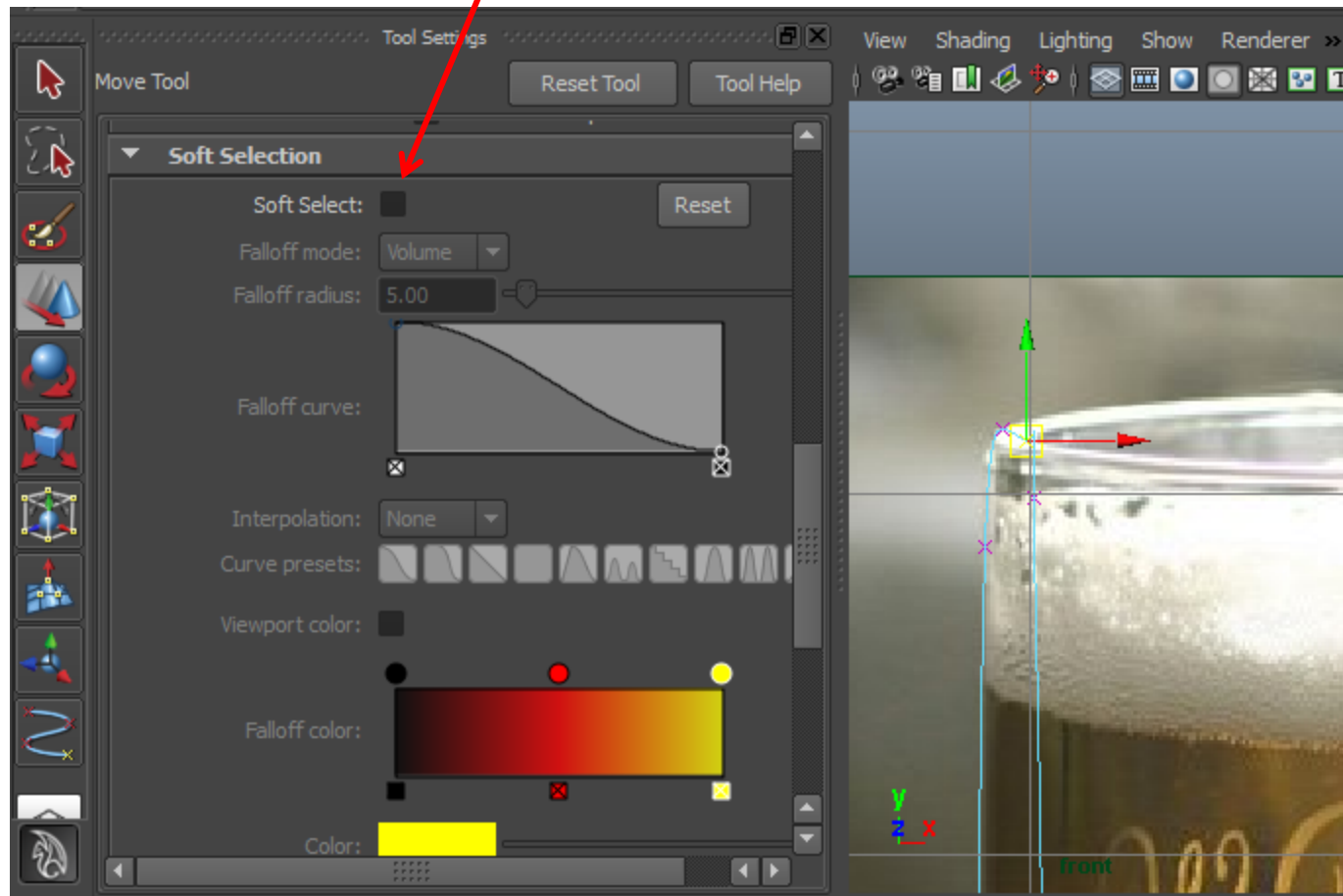


10. To add points, press and hold right-mouse button and drag the mouse cursor on the **Edit Point** mode. Under **Surfaces** module, **Edit Curves > Insert Knot > Option Box**. Select **Between selections**. Select two points from the curve, then press the **Apply** button. Another approach is using the **Add Points Tool**.

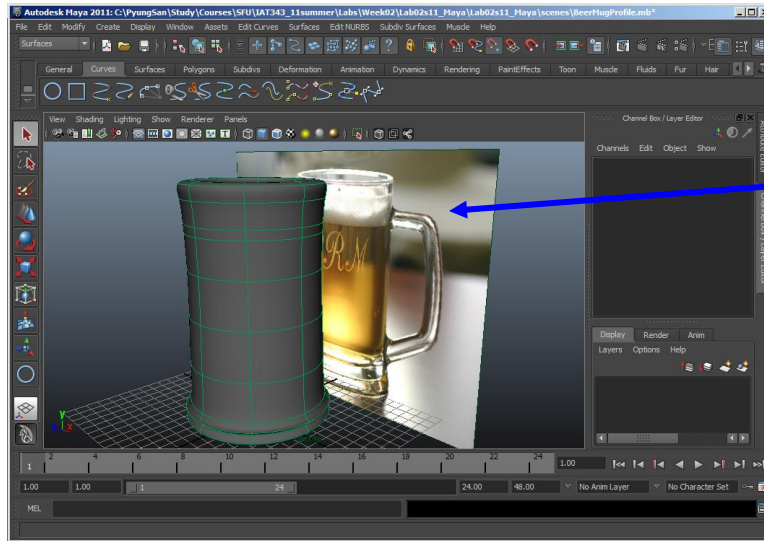
11. To construct a 3D surface covering an entire curve, it is important to switch back to the whole **Object Mode** selection by pressing **F8**. Before generating a 3D surface from the curve, adjust a default option in the **Surface > Revolve > Option Box**. To revolve around the Y-axis, select '**Y**' in **Axis preset**. Click **Apply**.

12. To change the shading of the model, press either **5**(flat shading) or **4** (wireframe).

Soft selection (on/off)



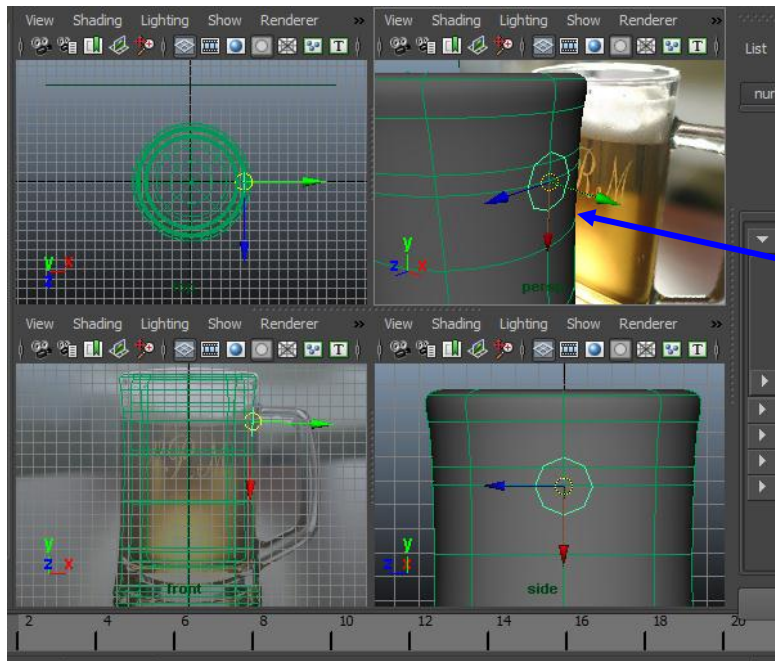
Step 3: Create a mug handle



13. By pressing the spacebar, maximize the perspective viewport. To add a mug handle, we will add more divisions on the surface. Hold **RMB** and select **Isoparm**. By using **Select Tool**, click an existing isoparm line (change to a red line) and hold/drag the isoparm line to the location where you will add a new line (change to yellow line). Release the mouse cursor.

14. Select the **Edit NURBS > Insert Isoparm**. To add more lines, repeat previous step until the surface has enough segments. To change the shading of the model, press either 4 (wireframe) or 5 (flat shading).

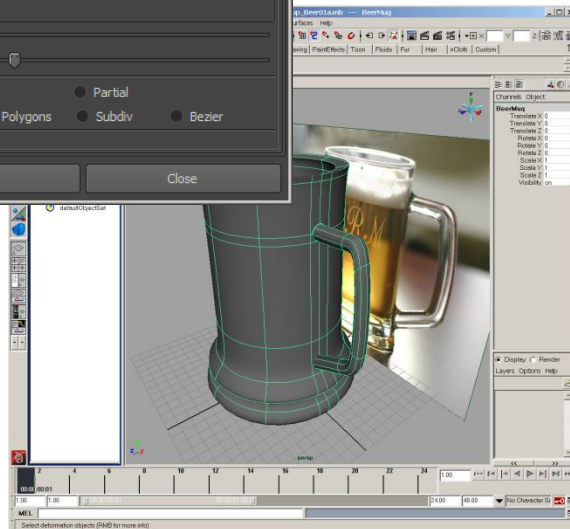
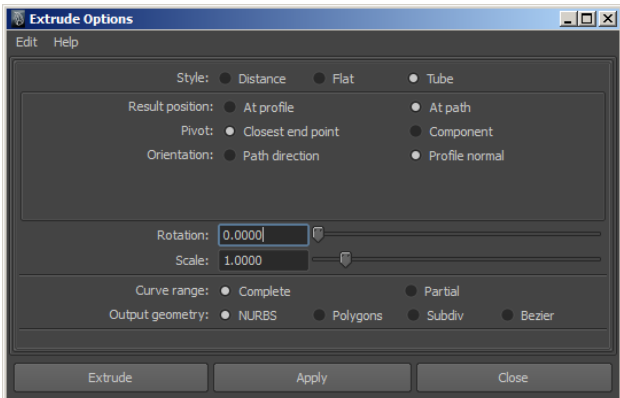
15. To create a handle for the beer mug, we will add a circle on top of the surface being used as the base profile curve. Switch to the **Object Mode** and apply **Modify > Make Live** function from the top menu bar which converts the selected surface to a live surface.



16. Switch to the **side** view and zoom into the handle area. Draw a circle by **Create > NURBS Primitives > Circle** on the cross point between lines. While having the **Make Live** mode, a curve can be drawn on top of the surface. Different snapping options provides more control to adjust the position of the curve.

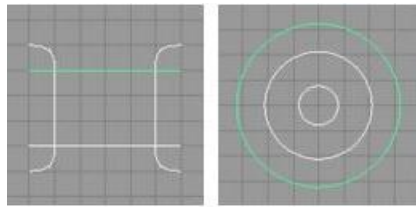


17. To bring the surface status back to the default state, apply **Modify > Not Live**. Reposition the circle where it matches the start of the handle in **front** view.

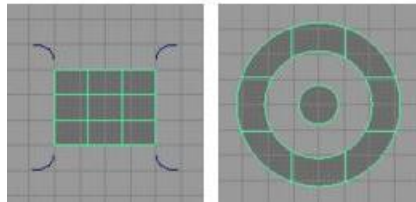


18. Switch to the **Front** view. We will draw a curve which will be used as an outline of the handle.
19. Select the **Create > EP Curve Tool**. Draw an outline of the handle close to the center location of the curve.
20. To generate a 3D surface, select both the Circle and the curve through holding **Shift** key. Select the **Surface > Extrude > Option Box**. Set option parameters similar to the image on the left (turn on the following options: **Tube**, **At Path**, **Path Direction**). Press '**Apply**' button.
21. Open an **Outliner (Window > Outliner)** to see all the objects in the scene.
22. To group two surfaces, select both objects and go to **Edit > Group**. Change the default name (group1) to on your own (i.e., BeerMug)
23. To manipulate the 3D shape, select the **Edit Point** of the outline curve. Grab number of points and use **Move**, **Rotate** or **Scale** tool to deform the shape.

Surface Modeling

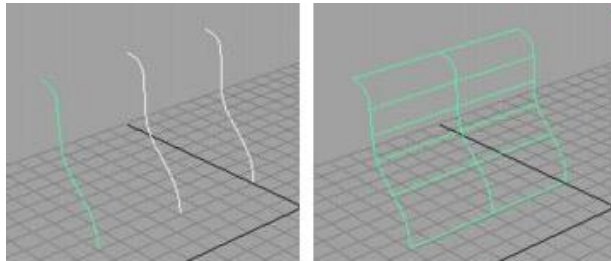


Original curves

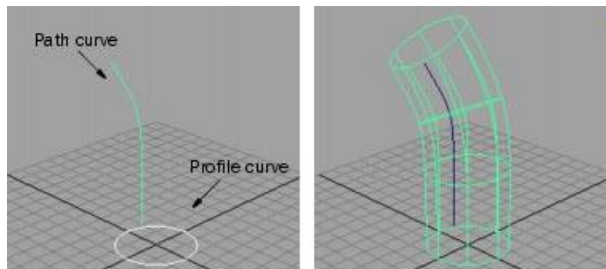


Planar trimmed surface

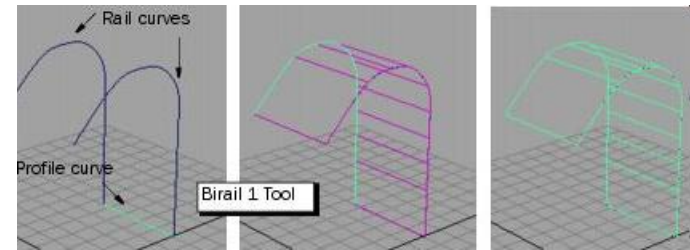
Surface > Planar



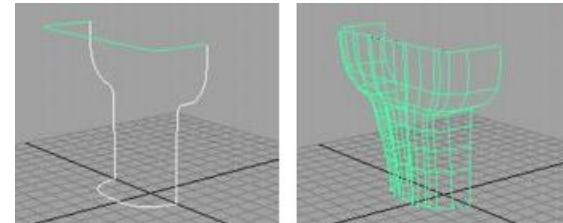
Surface > Loft



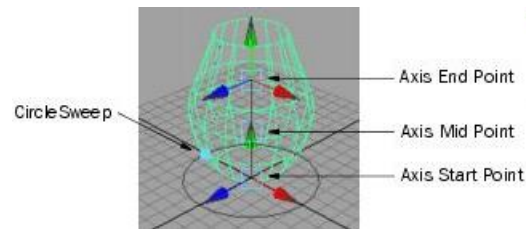
Surface > Extrude



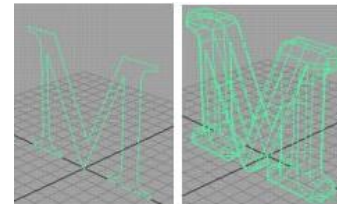
Surface > Birail



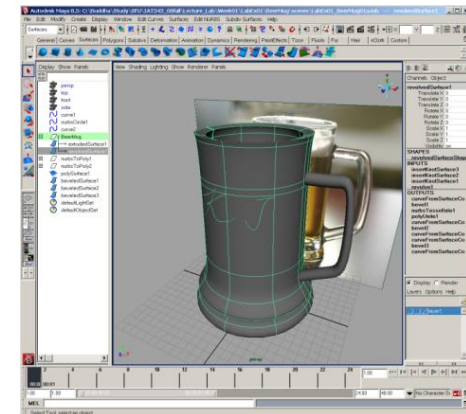
Surface > Boundary

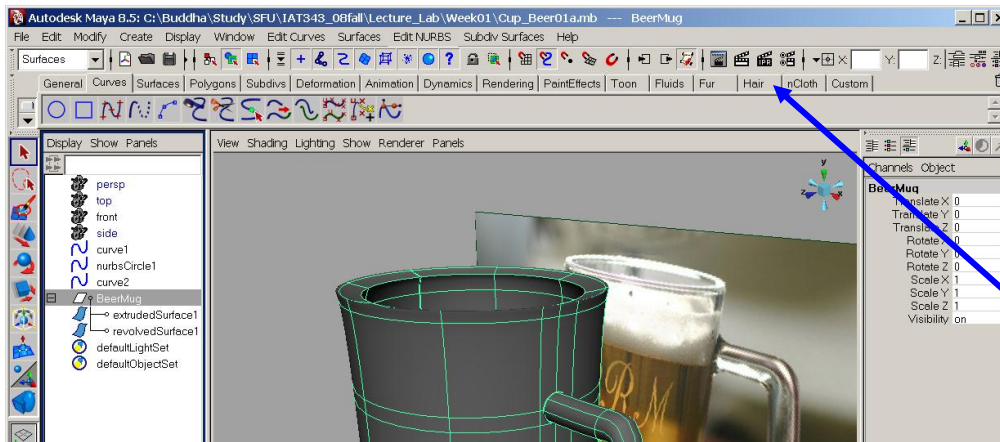


Surface > Revolve



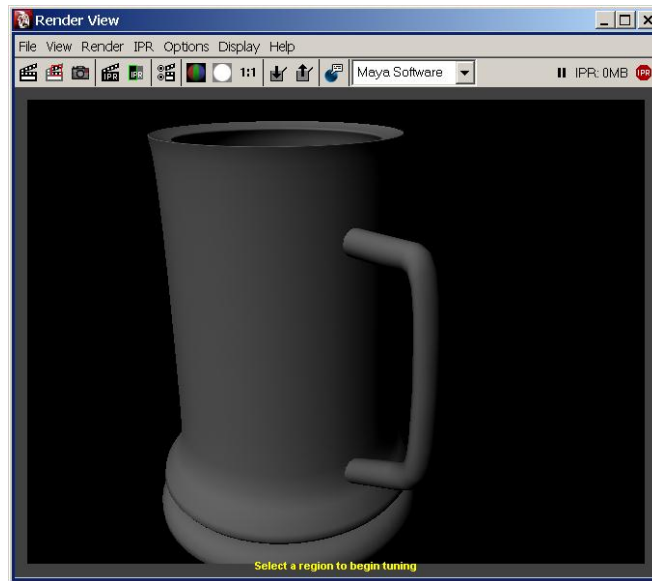
Surface > Bevel





Step 4: Save & Render

24. If you haven't saved your file, save it by **File > Save Scene as**. And name it **'yourLastName_initial_3_2.ma'**.
25. To render an image in the perspective view, click your mouse cursor in the **perspective** viewport to activate.
26. Press **'Render Current Frame'** icon on the toolbar to bring up the **Render View**. To save an image, go to the **File > Save image**, then select a file format and give a name (**'yourLastName_initial_3.2.jpg'**)
27. Play with other surface modeling techniques (i.e., Surface > Loft, Surface > Boundary) and add/create another object for the lab submission based on the surface techniques (i.e., wine glass).



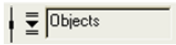
[Learning Resources](#) > [Tutorials](#) > [Getting Started with Maya](#) > [NURBS Modeling](#) >

Lesson 3: Lofting curves to create a surface

Selection options

Selection mask

The Status Line (toolbar) contains several different controls to change the selection mask. The selection mask determines what type of objects or components you can select.



The selection mode menu lets you select common preset selection masks.



The selection mode buttons let you switch between Select by hierarchy and combinations mode, Object mode, and Component mode.



The selection mask buttons let you make specific object/component types selectable or unselectable.

- [Selection, tools, and actions](#)
- [Select objects or components](#)
- [Select only certain types of objects or components \(selection masks\)](#)

Selection options







Lock /unlock current selection

Click the lock to lock the selection so the left mouse button operates the manipulator instead of selecting. Click the lock again to unlock the selection.

Highlight Selection mode

When you are selecting components in any component mode, object selection is disabled, so that you can stay in component selection mode; for example, to select multiple components (vertices, faces, and so on). To override this setting, so that clicking on a non-component part of your object selects the entire object (putting you back in object mode), turn Highlight Selection off.

- [Select objects or components](#)

To...	Do this
Select polygon vertices	<p>Set the selection type to vertices:</p> <ul style="list-style-type: none">• Press  on the polygon mesh and select Vertex from the context sensitive marking menu that appears. <p>or</p> <ul style="list-style-type: none">• If the polygon mesh or other component types are already selected you can change the selection type to vertices by pressing F9. <p>Then:</p> <ul style="list-style-type: none">• Select the dots that appear where the lines intersect on the polygon mesh.
Select polygon edges	<p>Set the selection type to edges:</p> <ul style="list-style-type: none">• Press  on the polygon mesh and select Edge from the context sensitive marking menu that appears. <p>or</p> <ul style="list-style-type: none">• If the polygon mesh or other component types are already selected you can change the selection type to vertices by pressing F10. <p>Then:</p> <ul style="list-style-type: none">• Select the lines on the polygon mesh.
Select polygon faces	<p>Set the selection type to faces:</p> <ul style="list-style-type: none">• Press  on a region of the polygon mesh and select Face from the context sensitive marking menu that appears. <p>or</p> <ul style="list-style-type: none">• If the polygon mesh or other component types are already selected you can change the selection type to vertices by pressing F11. <p>Then:</p> <ul style="list-style-type: none">• Select the dots in the center of the faces.
Select polygon vertices, edges and faces	<p>Set the selection type to multi:</p> <ul style="list-style-type: none">• Press the right mouse button on a region of the polygon mesh and select Multi from the context sensitive marking menu that appears. <p>Then:</p> <ul style="list-style-type: none">• Select components on the polygon mesh. <p>Multi component selection mode will select vertices, edges or faces based on whichever is closest to the mouse cursor.</p>
Select UV texture coordinates for a polygon mesh	<p>Set the selection type to UVs:</p> <ul style="list-style-type: none">• Press  on a region of the polygon mesh and select UV from the context sensitive marking menu that appears. <p>or</p> <ul style="list-style-type: none">• If the polygon mesh or other component types are already selected you can change the selection type to vertices by pressing F12. <p>Then:</p> <ul style="list-style-type: none">• Select the dots that appear where the lines intersect on the polygon mesh.