



**Visual Studies II: Arch 1291**  
**Fall 2012**

**Assignment Number:** 1 – Digital Modeling Review, Modeling Techniques  
**Computer Program(s):** Rhino, Photoshop, InDesign

**Student Learning Objectives:**

To solidify 3d modeling techniques acquired in 1191, including creating new files and Boolean strategies  
To practice forming, molding, shaping, attaching and subtracting techniques in the digital space.  
To learn the process of quickly adding color or texture to surfaces using the built-in Rhino material editor.  
Understand how to import to and edit in Photoshop.  
Understand how to create a layout in InDesign

**Assessment:**

*To evaluate the student's achievement of the learning objectives, the professor will do the following:*

1. Evaluate the student's understanding solid and surface modeling
2. Evaluate process documents to determine student's understanding of additive and subtractive modeling processes
3. Evaluate the student's ability to quickly add simple colors and textures to models
4. Evaluate student generated InDesign layouts for completeness

**Project Description:**

This project will review basic digital modeling commands in Rhino as well as introduce physical modeling in diverse materials. We will focus on the differences between solid and surface modeling in both digital and analogue methods. Review the terms at the end of this assignment sheet to re-familiarize yourself with the important technical distinctions.

You should examine, through making, the advantages of modeling physically and digitally. Try to duplicate methods of making between the digital and analogue world, moving in both directions. Over time, you will begin to instinctively understand when to choose one or the other (or a hybrid of the two) based on your skills and the suitability of the tools for the task.

Consider, as you model, the difference between additive and subtractive methods of making, and the tools used to implement both strategies in the analogue and digital world.

**Requirements**

You will create 2 digital models for both your Supercube and Uncube, resulting in 4 total cubes. You will use 2 different methods to achieve the same or similar effect for each cube.

**Process**

1. Review the terms listed in the following pages to re-familiarize yourself with the important distinctions between the tools and concepts you will be using to complete the assignment. Review the manual pages listed in the process below to re-familiarize yourself with the commands before beginning. **Read the complete assignment before beginning!**
2. Create a new Rhino file using the "Small Objects, Inches" template. Please use the correct NAMING convention for your file, i.e. Valdez\_F12\_First-Last(P01.0) with each following file (P01.1), etc.
3. Recreate your Supercube and Uncube digitally. You will create 4 cubes total. You will model the Supercube and the Uncube twice. Each time you will model the cube using a different technique. You should try to use all four techniques. You might choose:
  - a. Model a cube using surfaces only.

- i. Build up this cube surface by surface, but do not join these objects. Instead group the objects using **Group** (for the first two objects) and **AddToGroup** (to *add* objects to a group DO NOT USE GROUP).
    - ii. Add a material or color to each surface as you model it to match your chosen cube.
    - iii. Create a new layer for each material you use and name it for the color or material you have selected.
    - iv. Take a screen shot (use the print screen button on your keyboard) each time you add a surface and paste it into a Word file to document the process.
  - b. Model a cube using solids and Boolean subtraction operations only.
    - i. Carve this cube by cutting away objects from a larger 4"x4" cube. You will use only Boolean subtraction operations to complete this cube.
    - ii. Use the **ExtractSrf** command to isolate surfaces to add a color or material to each surface after you complete the subtractive modeling process.
    - iii. Create a new layer for each material you use and name it for the color or material you have selected.
    - iv. Take a screen shot (use the print screen button on your keyboard) each time you subtract a solid from the cube and paste it into a Word file to document the process
  - c. Model a cube using solids and Boolean union operations only.
    - i. Build up this cube by joining smaller objects together to form a larger 4"x4" cube. You will use only Boolean union operations to complete this cube.
    - ii. Use the **ExtractSrf** command to isolate surfaces to add a color or material to each surface after you complete the subtractive modeling process. Keep surfaces with like colors joined together.
    - iii. Create a new layer for each material you use and name it for the color or material you have selected.
    - iv. Take a screen shot (use the print screen button on your keyboard) each time you add a solid to the cube and paste it into a Word file to document the process
  - d. Map 6 images of your supercube or uncube onto a simple cube in Rhino.
    - i. You can draw a pattern for each side of your cube and scan it, cleaning it up in PhotoShop (it is best if you have a square image to map)
    - ii. Alternately you can take digital photos of each side of your cube, then clean and crop them in PhotoShop.
    - iii. Use the material editor in Rhino to map one image to each side of your cube to recreate your physical cube, digitally.
4. Create a 5 page 8.5x11 landscape InDesign Layout without facing pages. Each page will contain a perspective view and at least 1 elevation for each digital cube and its physical analogue, and (4 images on each page). You can take these images by using the print screen command on your keyboard and pasting them into PhotoShop. Crop the images appropriately and consistently and save the file as a .jpg.
5. Label each image, noting what technique was used to produce it.
6. Save and then File>Package your InDesign file.

### Submittal

Please submit to the project folder, within the first fifteen minutes of next week's class, your 4 digital model files, 3 Word documents that document your process, and InDesign package Folder.

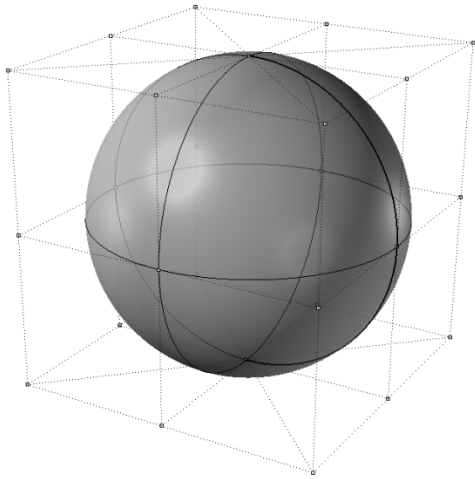
P01.0...03: Rhino Files (4)

P01.4...06: Word Files (3)

P01.7: InDesign Package Folder

## Vocabulary and Important Concepts

**NURBS** – Non-Uniform Rational Basis Splines: A mathematical model for generating curves and surfaces that has a high precision (nearing infinite smoothness) when describing smooth modeled surfaces. In this system control points are used to describe smooth curves and surfaces. It is discussed in contrast to polygonal systems which uses meshes, discussed below.



The control points for a sphere when modeling using NURBS. Notice that the points are a cube, and not on the surface of the object itself. A mathematical formula generates the shape.

### Point

[A point shows an exact position or location on a plane surface. It is important to understand that a point is not a *thing*, but a *place*. We draw a point by placing a dot with a pencil. This dot may have a diameter of 0.2mm, but a point has no size. No matter how far you zoomed in, it would still have no width.]

[www.mathopenref.com/point.html](http://www.mathopenref.com/point.html)

### Control Point

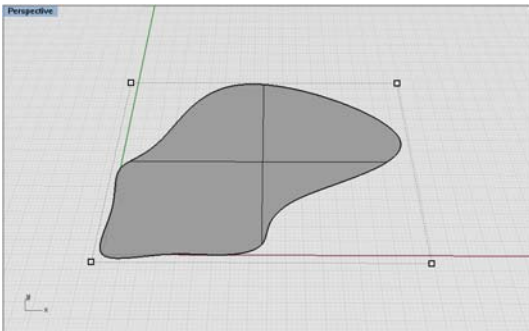
The points -- sometimes referred to as CPs -- that control the shape of curves and form of surfaces in NURBS modeling environments.

### Curve

Curves in NURBS modelers are controlled by a linear set of control points and their degree (see pg 3 for a chart of how degree will affect the shape of a curve.). Curves have no thickness and are not visible objects when a scene is rendered. Remember that curves with degree 1 are linear and the higher the degree, the smoother the curve.

### Surface

Surfaces are also controlled by control points and the degree of the surface. Generally, surfaces need at least two U and two V control points (see below).



U, V coordinates are used to describe objects independent of their XYZ orientation. For instance, this surface has 2 CPs in the U and 2 CPs in the V direction, if we were to rotate it in XYZ space, the U and V CPs would not change in relation to the shape.

### PolySurface

Multiple surfaces that have been joined together. They can be exploded to separate them or surfaces can be extracted from them with ExtractSrf. PolySurfaces can be **open** or **closed**.

**Open** PolySurfaces are not watertight. They do not close on themselves.

**Closed** PolySurfaces are often referred to as solid. These surfaces are watertight (if you filled them with a liquid, there is no place they would leak. Even a tiny hole can prevent a PolySurface from being closed.

### Scale

The ratio that determines the relationship between a representation and the object that it represents. Often expressed as scale units to real units, ie. 1 inch = 1 foot. Scale maintains general proportions, but enlarges or reduces measurements equally. The scale of a drawing or model is directly related to how much, and what kind, of information it can convey.

### Size

How big or small something is.

### Form

The three dimensional geometry of an object. For instance a sphere or cube.

### Shape

The two dimensional geometry of an object (a slice through a nearly spherical orange is roughly a circle)

### Texture

The shape or form of a surface. Ie. Smooth, rough, soft, bumpy, wrinkled. This can also refer to the way different parts of a composition relate to one another in a work.