Design Programming 2

ARCH-4960-80 | 6966-80
Tue 1:00 PM – 3:50 PM
Office hrs by appointment
Credits: 3

Agenda

- Introduce the course
- Start doing some small programming

Next week: C# Language

Course Goals

1. Explore & Learn in depth “Rhino under the hood” in its various flavors
   - Grasshopper C# / Python components
   - Grasshopper & Rhino plugins
   - Rhino inside / compute / Rhino3dm.js

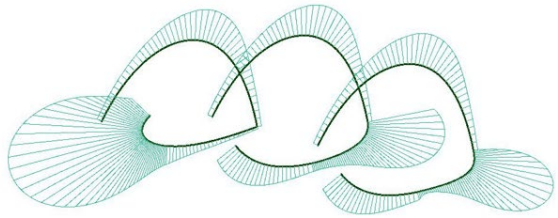
2. Use “algorithmic geometry” as the organizing set of examples where possible:
   - Ability to code in ways that support generated geometries
     C# and the Rhino common libraries
   - Some curve & surface math – *how Rhino handles geometry*

Essential Guide to

C# Scripting

for **Grasshopper**

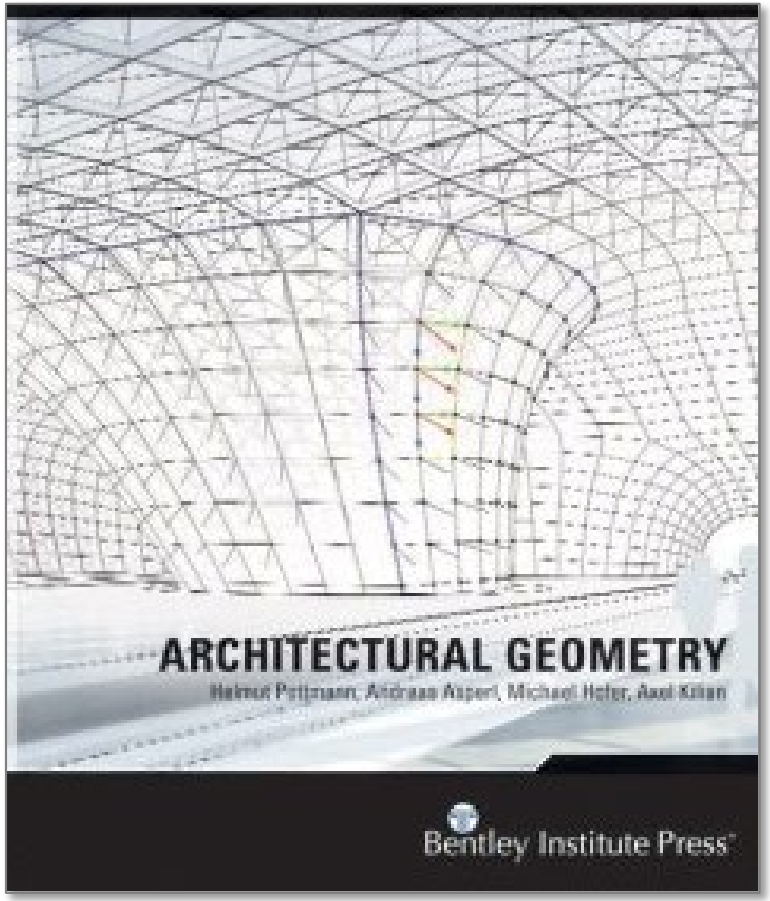
Rajaa Issa
Robert McNeel & Associates



Essential Mathematics

for Computational Design - Fourth Edition

Rajaa Issa
Robert McNeel & Associates


ARCHITECTURAL GEOMETRY
Bentley Institute Press

Modules 1 & 2 – Major development environments

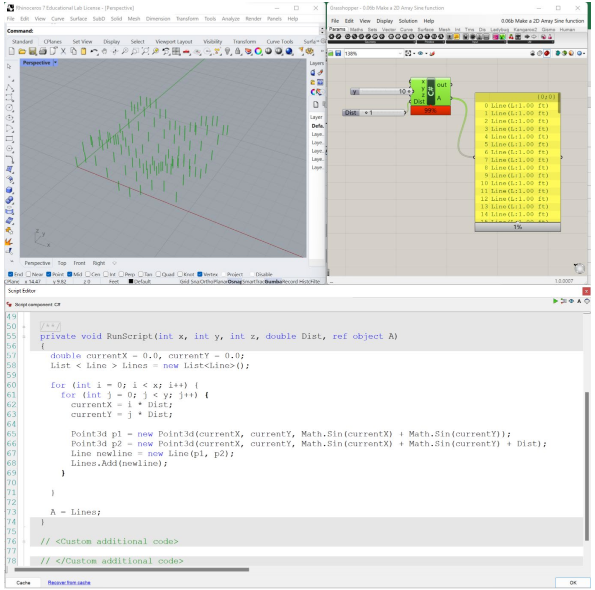
DP2 will cover ~2-3 core application environments, and provide a survey of a few others.

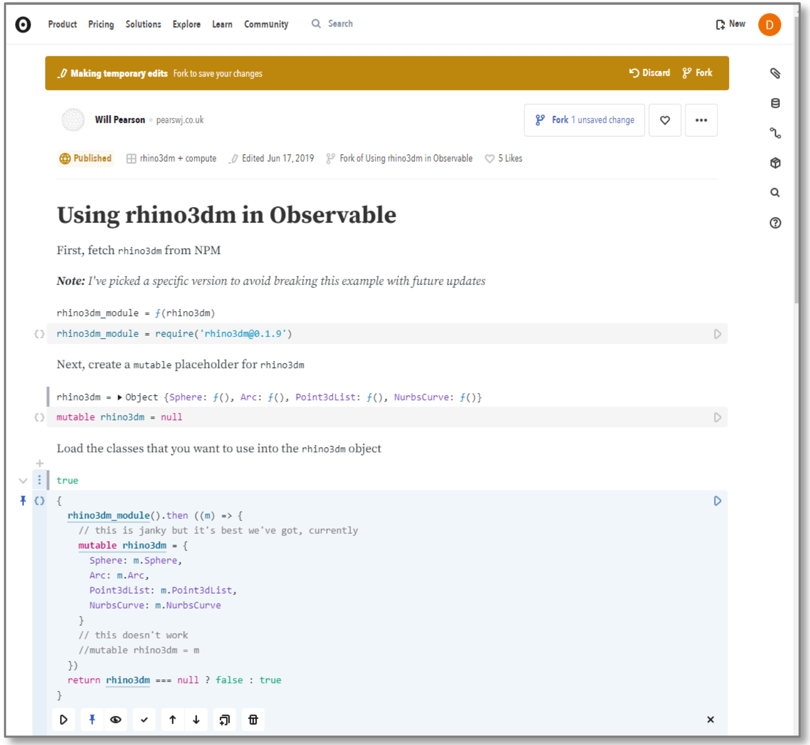
Rhino Common
libraries and their application to various Rhino environments

Grasshopper scripts
GH plugin development
Rhino Compute web services

Plus a bit of web services at the end

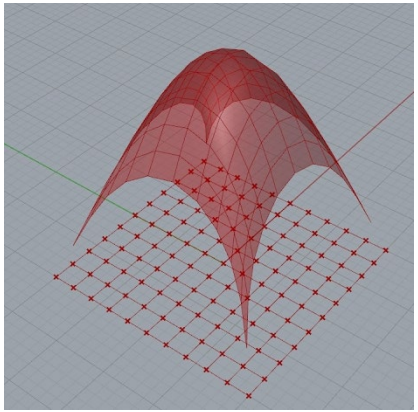
Platforms to be covered

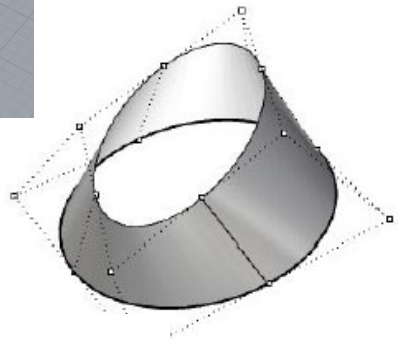


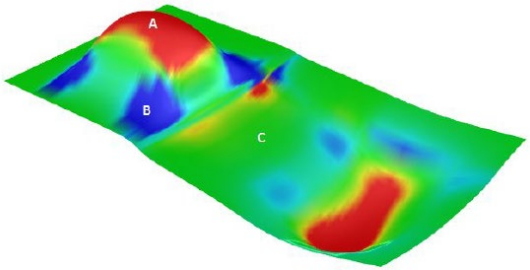


Geometry to be covered

- *Linear algebra*
  (coordinate arrays, vectors, dot and cross products, transformation matrices)
- *Differential geometry*
  curve and surface mapping functions, curvature
- “Simpler” elements: meshes and voxels
- *Recursive geometries*
  subdivision curves and surfaces, fractals, Bezier and NURBS
- “Physical based” modeling:
  particles, springs, Kangaroo.
- A few specialized surface types
  Developable surfaces, vornoi, grids, etc.







Programming & Computation to be covered

- Basic C# development & standard language
- Rhino Common library
- Vectors and Matrices
- Recursion
- Plugin development
- Possibly: Web - JavaScript, Compute, THREE.js

	T		Overall topic	Platform topic	Coding / Geometry topic
1	10-Jan		Intro	Grasshopper - C# GH component	Grasshopper C# component
2	17-Jan	MLK Day	C# Language		C# language overview
3	24-Jan		Geometry - Points & Lines		Linear algebra, dot & cross products
4	31-Jan		Geometry - Curves & Surfaces		Parametric curve & surface geometry
5	7-Feb		Surface Algorithms - Sin & Cos, Transformations		Transformation matrices
6	14-Feb		Surface Algorithms - Recursion		Recursion algorithms
7	21-Feb				
8	28-Feb		Surface Algorithms - NURBS & Subdivision Surfaces		NURBS Surface geometry
9	7-Mar	Spring Break			
10	14-Mar		Surface Curvature & Developable Surfaces	Grasshopper & Rhino plugins	Surface curvature
11	21-Mar		Triangulation & Vornoi		Triangulation, closet point, etc.
12	28-Mar		Solids & Voxel algorithms		Voxel arrrays
13	4-Apr		Physics based modeling		Particle physics systems
14	11-Apr		Web: standing up a server	Rhino3dm.js & web	Web services, javascript
15	18-Apr		Rhino3DM.JS		Rhino3DM
16	25-Apr		ThreeJS, Observable, etc.		Rhino3DM & Three.js
17	2-May	Final Exams			

Final Project

Project of your own design. Examples:

- Develop a specialized app that uniquely generates algorithmic designs for a studio or other design project.
- Online / hybrid design or data workflow.
- Generate a system of components and then extract data from them.

Class requirements

- Windows PC or Mac running Bootcamp
- Rhino 7 license and installed
- Visual Studio (free download)

Grading

4 projects, final project counts 2X, ie	5X:
● Completeness of assignment	4 points
● Interpretation & Quality	4 points
● Attendance & class participation	2 points
	50 points total

Late without approval - 5 points

Late more than a week - 10 points

Rough ranges

30-40 B

40+ A

IE	
Strong interpretation and going beyond the letter	A- to A
Basic completion of assignments	B to B+
Significant gaps in attendance, assignments	C to B-
Completely missing sections without remediation	D to C-

Questions?