

Geometrical and Generative Modeling - 2013/2014 (1st semester)

Teacher: Professor Luís Mateus

Materials: <http://www.fa.ulisboa.pt/~lmmateus>

1st Week (16/09 to 20/09)

>> Presentation of the course objectives

>> Framing Geometrical and Generative Modeling

Web:

<http://www.generative-modeling.org/> (about generative modeling language; usefull to understand the paradigm)

http://en.wikipedia.org/wiki/Visual_programming_language (about the concept of visual programming)

http://en.wikipedia.org/wiki/Solid_modeling#Parametric_modeling (the concept of parametric modeling)

<http://www.grasshopper3d.com/> (Grasshopper web site)

<http://www.parametric-modeling.net/> (contains GH examples)

<http://www.danieldavis.com/parametric-modelling-is-hard/> (cons of parametric modeling)

Texts:

Cook, M (2004). Historical perspective – future prospect, in Digital Tectonics. London: Wiley Academy. pp. 40-49

(www.fa.ulisboa.pt/~lmmateus/1314_1_sem/Cook_2004.pdf)

L. Mateus, F. Roseta, F.V. Monteiro (2013). Visual programming as tool for architectural Design, in proceedings of the 1stInternational Conference on on Algebraic and Symbolic Computation (SymComp2013). 9-10 September, IST: Lisbon, Portugal. ISBN: 978-989-96264-5-4. pp. 412-421

(www.fa.ulisboa.pt/~lmmateus/1314_1_sem/MateusRosetaMonteiro_2013.pdf)

2nd Week (23/09 to 27/09)

>> The notion of algorithm (using a recipe as a metaphor)

>> Install the student webpage (using the template provided by the teacher)

3rd Week (30/09 to 03/10)

>> Introduction to Rhinoceros software

- The workspace (menus, toolbars, tabs; viewport properties; options; display options; layers; snap; cplane)

- Exploring the menus: curve, surface and solid, to study different types of lines (lines, polylines, arcs, conics, nurbs), different types of surfaces (plane, loft, revolution, sweep, edge curves)

>> Introduction to the study of surfaces (general classification criteria)

>> Introduction to Grasshopper

- A program to draw the generatrices of cylinders, cones and revolution hyperboloids (Are they the same thing?).

- Parameters > Input (*Number Slider, MD Slider, Control Knob, Panel*)

- Parameters > Geometry (*Curve, Brep*)

- Parameters > Util (*Scribble*)

- Vector > Point (*Construct Point*)

- Vector > Plane (*Construct Plane*)
- Curve > Primitive (*Line, Circle*)
- Curve > Division (*Divide Curve*)
- Maths > Trigonometry (*Radians*)
- Surface > Freeform (*Loft*)
- Surface > Util (*Cap Holes*)
- Transform > Euclidean (*Rotate*)
- Group/Ungroup; Connect/Disconnect; Wire Display; Data Tree (paths – branch/index)

4th Week (07/10 to 11/10)

- >> The study of surfaces – ruled surfaces.
- >> Grasshopper/Rhino
- A program to draw ruled surfaces defined by 3 lines.
 - Surface > Freeform (...*Extrude*)
 - Surface > Primitive (*Sphere*)
 - Intersect > Physical (*Brep/Brep, Curve/Curve, Surface Split*)
 - Transform > Affine (*Scale, Project*)
 - Sets> Tree (*Clean Tree*)
 - Curve > Util (*Project*)
- Set parameters (picking objects in Rhino)

5th Week (14/10 to 18/10)

- >> Rapid prototyping and digital fabrication (class by José Nuno Beirão).

6th Week (21/10 to 25/10)

- >> The study of surfaces – polyhedra .
- >> Grasshopper/Rhino
- A program to draw the platonic solids.
 - Parameters > Input (...*Value List*)
 - Curve > Primitive (...*Polygon*)
 - Surface > Analysis (*Area*)
 - Surface > Freeform (...*Fragment Patch*)
 - Surface > Primitive (*Sphere Fit*)
 - Surface > Util (...*Brep Join*)
 - Maths > Operators (*Equals*)
 - Maths > Scrip (*Expression*)
 - Maths > Trigonometry (...*ArcSine*)
 - Sets> Tree (...*Flatten Tree, Merge*)
 - Sets> List (*Dispatch, List Item*)
 - Transform > Array (*Polar Array*)
 - Transform > Euclidean (...*Mirror*)

7th Week (28/10 to 01/11)

- >> The study of surfaces – surfaces of revolution .
- >> Grasshopper/Rhino
- A program to draw and morph revolution surfaces.
 - Maths > Domain (*Construct Domain, Construct Domain2, Deconstruct Domain2*)
 - Surface > Freeform (...*Revolution*)
 - Surface > Util (...*Isotrim*)
 - Vector > Grid (*Rectangular*)
 - Transform > Euclidean (...*Move*)

- Transform > Affine (...*Scale NU*)
- Sets > Sequence (...*Random, Series*)
- Sets > Text (*Concatenate*)
- Sets > List (...*Sub List*)
- Parameters > Primitive (*Integers*)
- Reparametrize (inside components), Set values (inside components), Text tag

8^a Week (04/11 to 08/11)

>> Between geometry and tectonics – the idea of stereotomy.

>> Grasshopper/Rhino

- A program to draw an arch and display its pieces in the floor.
 - Maths > Util (*Minimum*)
 - Curve > Primitive (...*Arc*)
 - Curve > Util (...*Offset*)
 - Curve > Analysis (*Endpoints, Evaluate curve*)
 - Vector > Vector (*Vector 2Pt, Angle, Rotate*)
 - Vector > Plane (...*Plane Origin*)
 - Curve > Util (*Join curves*)
 - Maths > Domain (...*Deconstruct Domain*)
 - Surface > Primitive (*Bounding box*)
 - Surface > Analysis (...*Brep Edges*)
 - Transform > Euclidean (...*Orient*)
 - Vector > Colour (*Colour RGB, Custom Preview*)

9th Week (11/11 to 15/11)

>> Presentation of the Evaluation exercise.

10th Week (18/11 to 22/11)

>> Monitoring the development of the evaluation exercise.

11th Week (25/11 to 29/11)

>> Monitoring the development of the evaluation exercise.

12th Week (02/12 to 06/12)

>> Monitoring the development of the evaluation exercise.

13th Week (09/12 to 13/12)

>> Delivery of the exercise.

14th Week (16/12 to 20/12)

>> Evaluation of the exercise and final remarks.