

Generative Scripting (Beginners Session)

Southern California Institute of Architecture
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Instructor **Nick Pisca** _____

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Proposal S08:

*** The workshop will be a beginner course on automation and computer programming for architecture and engineering: This class will be broken down into three segments, described below.

-- An accelerated introduction to Maya MEL (Maya Embedded Language) for individuals who do not know the basics of computer programming. This will entail learning the basics of a C-based programming language and how to bypass the Graphic User Interface (GUI) in the service of data-driven form creation.

-- An intense program of advanced 'generative' computational methodologies.

Topics include: Automated parametric organization, emergent behavior, genetic algorithms, methods of morphogenesis, variations of cellular automata, program-to-program communication, and modes of scripting efficiency.

-- The portion of time will be focused on advanced forms of translating scripted assemblies into physical entities via computational methods, in real-time and/or one-way output. Modeling and automation techniques will be pulled such various fields as architecture, industrial design, cinema, sculpting, fashion, et cetera.

Each class will have supplementary relevant historical lessons to accompany respective topics.

There will be an emphasis on the four modes of computational automation:

-- Generative, -- Representational, -- Analytical, -- Construction

Generative Scripting encompasses the modes for producing an automated structure, utilizing the aforementioned topics.

Analytical Scripting is an automation technique to convert generated geometry to usable data translated for future use.

Representational Scripting entails the use of automation to produce an illustration to effectively communicate a potential physical system. The 'illustration' can be text, linear, cinematic, musical, etc.

Construction Scripting is a similar translation to Representational, but its focus is in the production of a physical form rather than an illustrative. Methods to be explored are rapid-prototyping, CNC modifications, G-code authoring, etc.

Prerequisites:

Although experience with Maya will ease an individual into MEL scripting, this is not required. Some Maya scripters do not use the interface at all.

Schedule: (All classes meet in the MAC LAB)

Class1: Sat Feb 23 10am-1pm

Class2: Sun Feb 24 7pm-10pm

Class3: Wed Feb 27 7pm-10pm

Class4: Sun Mar 2 7pm-10pm

Class5: Wed Mar 5 7pm-10pm

Class6: Sun Mar 9 7pm-10pm

Final: TBD

Active & Pro-Active Classtime:

Occurring once a week for six total weeks, each class will last for two consecutive 1.5 hour periods, separated with a ten minute break. After hours, I will be available nearly anytime over the net at the following portals:

skype: nicholaspisca email: nickpisca@gmail.com msn: nicholas.pisca gmail chat: nickpisca SL: NP Elcar

If needed, I will designate official office hours.

Students are strongly ENCOURAGED to work together, but always to produce individual projects. Also, when possible, students are encouraged to integrate this work into other classes, and vice versa.

Students will work individually for the first couple class periods on simple projects to ensure familiarity with the new language and Maya interface basics, with an emphasis on modeling, rendering, animation and lighting. For the second portion, they will develop research methods from the list above. All research must be outputted with a scripted tactic.

Assignments:

All assignments will be emailed to nickpisca@gmail.com at noon the day BEFORE class. This will allow me to correct and present exceptional work. It will also be used to demonstrate debugging solutions.

Depending upon the available resources, everyone will post their scripts, videos, and images to a wiki weekly.

Suggested Course Resources:

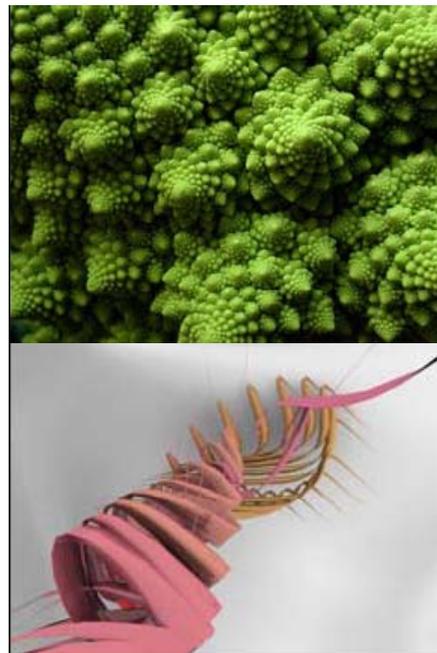
- [- Pisca, Nicholas. SoCal Scripting Database www.nickpisca.com/go
- [- Gould, David A. D. "Complete Maya Programming. An Extensive Guide to MEL and the C++ API" 2003
- [- Frazer, John. "An Evolutionary Architecture."
- [- Thacker, Eugene. "BioMedia"
- [- Thompson, D'Arcy Wentworth. "On Growth and Form"
- [- DeLanda, Manuel. "A Thousand Years of Nonlinear History"
- [- Spiller, Neil. "A+D Reflexive Architecture"
- [- Editor, "A+D Programming Cultures"
- [- GSAPP class tutorials <http://www.arch.columbia.edu/index.php?pageData=50637>
- [- Clarke, Cory. NTHD.org
- [- Puckett, Nick. MEL resource website TBA
- [- Programmer MEL/Maya resource <http://highend3d.com/maya>

//Post Digitalism

Computational Design with Intelligent Systems through Scripting

Program and Class Timeline

- MEL / C++ Basics;
- [1.0]MEL - Introduction>>
- [2.0]MEL - Scripts>>
- [3.0]MEL - Running>>
- [4.0]MEL - Bypass GUI>>
- [5.0]MEL - Execution>>
- [6.0]MEL - Variables>>
- [7.0]MEL - Scripting logic>>
- [8.0]MEL - Loops>>
- [9.0]MEL - Procedures>>
- [10.0]MEL - Others>>
- [11.0]MEL - Assistance>>
- [12.0]MEL - Querying attribute>>



[13.0]MEL - Using Time>>

Weekly Topics: topics[] = { week1 , week2 , week3 , week4 , week5 , week6 }; Six Total Days

- topics[1]= **MAYA BASICS**

navigation and interface Lecture: Modeling vs. Scripting vs. Parametrics
PAN, ORBIT, ZOOM, SELECTION, TIMELINE, EDITORS, KEYFRAMING

MEL BASICS

"variables-declarations/conversions" + operators

STRINGS, FLOATS, INTEGERS, PRINT(), &&, ||, ++, \$VARIABLE

if, else if, loops, and basic Maya commands.

CONDITIONALS, SPHERE, MOVE, ROTATE, SCALE, SELECT

[HW]: print three generative sentences using MEL.

[HW]: complete the Modeling Workbench tutorial

- topics[2]= **MAYA & MEL geometry - "Repetition vs. Iteration vs. Recursion"**

Lecture: Repetition, Iteration, Recursion; Cellular Automata [Wolfram, Stephen]

MAYA NODES [SCRIPTED AND UNSCRIPTED]

[HW]: produce one basic repetitive and one recursive geometric sequence, using three topologically dissimilar primitives.

- topics[3]= **analyzing existing geometry and getting, printing & connecting attributes.**

Lecture: emergence and evolution; importance to 4D-modeling

GETATTR, SETATTR, POINTPOSITION, LISTATTR, XFORM

[HW]: using the previously created assembly, extract latent geometric data into a collection.

- topics[4]= **representational scripting and dynamic display**

Lecture: Post-Digitalism and the fallacies of Digitalism

SETKEYFRAME, ATTRIBUTES, CURRENTTIME, HISTORY, NODES

[HW]: translate the latent generative 3D DNA from the previous assembly into an animation

- topics[5]= **expressions and intermediate mathematics**

Lecture: Importance of Recoding, Encoding, Decoding [Thacker, Eugene]

EXPRESSION, SIN, RAND, ABS, POW, TIME, FRAME, %

[HW]: connect the attributes of six different geometry-types with expressions and catalog the resultant behaviors.

[HW]: bring in a joystick/keyboard/digital recording device/video camera/etc

- topics[6]= **transdisciplinary communication - music/gaming/visual effects/architecture**

CONNECTATTR, GLOBAL & LOCAL PROC, FUNCTIONS, SERVER SETUP

[HW]: establish the docserver and setup a simple motion-capture connection in Maya

presentation of iterative/recursive assembly & respective cinematic/musical representation

presentation of FINAL transmodal generative construction

required: 3D model, completely script generated.

30-second animation, no build-up videos; just representation and analytical scripts

dynamic construct, produce a physical object that exhibits a secondary information flow

one 11x17 foamcore mounted board, describing the data-driven aspect for generation

(\$ADVANCED) includes the exploration in to the techniques for visualization

- topics[1A]= cellular automata and basic neighbor influence

- topics[2A]= advanced automata and local influence (flocking)

- topics[3A]= "Non-linear Time", and Evolution and Eugenics

- topics[4A]= Sociological and program-to-program communication

- topics[5A]= Advanced programming.