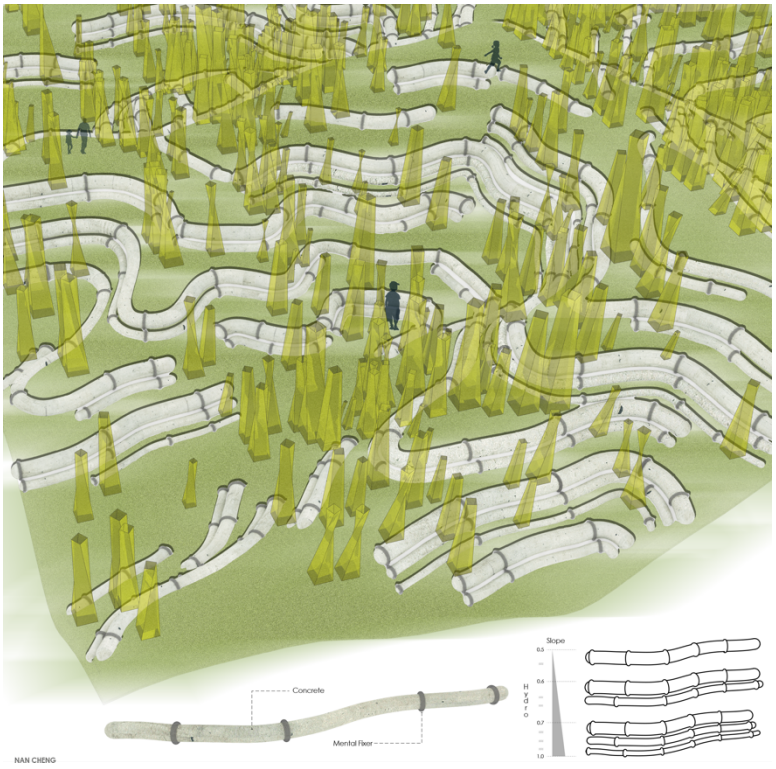
USC School of Architecture



Arch 540: Topics in Media for Landscape Architecture

Grasshopper for Landscape Architecture

Landscape Architecture 540L, 2 units
Fall 2018 Semester

Instructor	Alexander Robinson, Assistant Professor Landscape Architecture & Urbanism Program
Location	Waite Philips Hall, WPH B36
Time	Tuesdays, 10-11:50AM
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Office Hours	WAH 319, Office Hours by Appointment

Introduction

This class teaches and explores how to employ Grasshopper—the visual algorithmic programming plugin for the 3D modeling software Rhino—within the practice of landscape architecture design. The Grasshopper plugin is a valuable addition to the digital practice of landscape architecture for several reasons, including in ways that stray from its standard uses in architecture. While it is perhaps best known for "parametric" form-making associated the self-declared architectural school of practice: "Parametricism" (and less controversial applications) it is a highly adaptable and generic tool. Its facility in integrating algorithmic processes holds no specific allegiance to generative form-making and can be utilized to computationally enhance all sorts of applications. In fact, perhaps its most fundamental value to landscape architecture is something more prosaic. Most advanced 3D modeling tools are rarely attuned to landscape architecture interests. Grasshopper's faculty in developing custom computational processes allows landscape architects to customize Rhino to the needs of the practice. While grasshopper is broadly useful for all sorts of tasks, its greatest utility lies within improving and deepening the practices of topographic design.

The class will focus on developing skills and tools to confront the following topographic design challenges:

Translation. How do we manage and "own" topographic datasets and their various digital representations? We will assemble tools construct and de-construct topographic data into different forms of data and representations – actions that are both generally useful in managing large, often-raw, data-sets as well for their generative design and aesthetic value.

Analysis. How can we employ computational power to generate and represent critical analyses of topographic surface? We develop custom tools that not only generate custom datasets, but our carefully integrated in broad spectrum of design processes, digital and analog.

Composition. How does grasshopper help us create topographic compositions, whether of topography itself, or with the artifacts of its translation and analysis? We will develop tools that allow us to "sketch" topography or other landscape-specific features in Rhino/Grasshopper with relation to our custom analyses and other site factors and constraints.

While the class is largely dedicated to making students proficient in grasshopper, along the way the class will address multiple relevant topics, including data (e.g. resolution & fidelity), representation, authorship, analysis, and design process. Undoubtedly, we will also generate new forms, indicative of the algorithmic modeling, if only by virtue of the deeper relations to custom computational analysis, representation and drawing.

Assignments

Weekly Assignments

There will be an assignment posted on blackboard at the end of each class instruction, based on the material covered in the lab. Unless otherwise noted, the assignment is due at the next class.

Assignment Procedures & Policies

To submit an assignment, you must upload a PDF to blackboard (150 dpi minimum resolution—I recommend converting a PNG file to a PDF) **and** bring in a printed version of your drawing. If you fail to do either before the beginning of class, the assignment will be considered void and late. You may submit *two* assignments *one* week late (at the next class meeting), after which no further late assignments will be accepted. In some cases, you will also submit a drawing showing your custom "interface" for your drawing. Select students will be asked to present their drawings to the class, time allowing.

Grading will be based on the following: completion of the assignment and successful execution of the grasshopper script (50%), quality of the final drawings presented in class (30%), and quality of the "design" content (20%).

Drawings will be pinned up at the beginning of each class. They should be printed and trimmed to the highest standards of quality. Assignment grades will be based on printouts. As a general rule, most drawings need to be printed at least twice, if not more to account for legibility and printer error. Any errors or unexpected results from the printing is strictly your business!

Final Project

The final project will be proposed by the student, employing an iteration of the tools developed in the class. Students will present a draft of it the assignment in consultation with the professor and class on the final class day. The final product will be presented instead of a final. Final products may be drawings, models, or both.

Final Grading Breakdown

5% Participation and Attendance

75% Class Assignments

20% Final Assignments

Course Schedule

CLASS #	DATE	TOPIC
1	8/21	**Introduction to Grasshopper** **Points, Curves** Assignment: Translation #1
2	8/28	**Lists** Assignment: Translation #2
3	9/4	**Vectors** Assignment: Composition #1
4	9/11	**Planes I** Assignment: Translation #3
5	9/18	**Planes II** Assignment: Composition #2
6	9/25	**Curves I** Assignment: Analysis #1
7	10/2	*Catch-up day (No-Class, Professor Robinson Away)*
8	10/9	**Curves II** Assignment: Analysis #2
9	10/16	**Curves III** Assignment: Composition #3
10	10/23	**Meshes I** Assignment: Composition #4
11	10/30	**Meshes II** Assignment: Analysis #3
12	11/6	**Meshes III** Assignment: Analysis #4
13	11/13	**Meshes IV** Assignment: TBD
14	11/20	**Final Project, Proposal Presentation**
15	11/27	**Final Project, Consultations**
		Finals Pin Up (Time and Place TBD)

Class Methodology

All classes will meet in the computer lab. Students may use the lab computers, but it is highly recommended that students bring their own computers with Rhino V5, newest version of grasshopper loaded. The lab computers will have Rhino V5. If students plan on using the lab computers, please bring a flash drive or portable hard drive to work off.

Most classes will entail a pin up of previous homework, live demonstration on the computer, followed by some lab time for students to practice the methodology and/or discuss and troubleshoot outstanding issues. As much as time is allowing there will be some presentation/discussion of specific topics related to landscape architecture, computation, and grasshopper.

Each class, a few students will semi-randomly be selected to present their pinned up homework.

Pre-Requisite Knowledge

Students are recommended to have at least a minimum familiarity with the Rhino modeling environment and ideally V-Ray. Some students have taken the class without having prior instruction in Rhino, but this is only recommended for students who are confident in their ability to learn basic operations in new software. While necessary to run Grasshopper, in this class Rhino is primarily utilized as an "interface" for Grasshopper. Rendering will not be taught.

Please let me know if you have concerns. We can discuss!

Software

Rhino V6 is available on the lab computers and for purchase with an educational discount. To run grasshopper and effectively complete the assignments you will need to run Rhino in Windows. This is installed on the lab computers, but I recommend you install it on your own laptop to maximize your workflow and give you freedom to install additional plugins.

There is a new version of Rhino (V5) that includes grasshopper on the mac, but I am not sure it will work with many useful plugins. You might find a way to squeeze by with this version and the lab computers, but I can't make any guarantees.

In my experience, the most effective way to run Rhino on a mac (which I know many of you have) is to use "bootcamp" primarily (and with parallels occasionally if you like). It is the fastest and you'll want to maximize speed. I recommend you set this up before school starts as it takes some time!

http://www.grasshopper3d.com/

Bibliography and Resources

Cantrell, B. (Ed.), Mekies, A. (Ed.). (2018). *Codify*. London: Routledge.

Cantrell, Bradley, and Justine Holzman. *Responsive Landscapes: Strategies for Responsive Technologies In Landscape Architecture.* First edition.

Walliss, J., Rahmann, H. (2016). *Landscape Architecture and Digital Technologies.* London: Routledge.

Jillian Walliss, Zaneta Hong, Heike Rahmann & Jorg Sieweke (2014), "Pedagogical foundations: deploying digital techniques in design /research practice," *Journal of Landscape Architecture*, 9:3, 72-83.

M'Closkey, K., VanDerSys, K. (2017). *Dynamic Patterns.* London: Routledge.

Belesky, Philip. "The Green Grasshopper." *Journal of Digital Landscape Architecture*, no. 3 (May 30, 2018): 406–413.

Rhino 3D
Lynda Tutorial: Rhino 6 Essential Training with Dave Schultze
http://itservices.usc.edu/lynda/

Central Location for Tutorials
http://www.rhino3d.com/tutorials.htm

Grasshopper
Lynda Tutorial: Up and Running with Grasshopper with Chris Reilly
http://itservices.usc.edu/lynda/

Tutorial & Manuals
http://www.grasshopper3d.com/page/tutorials-1

Plethora Project (by USC's own Jose Sanchez)
https://www.plethora-project.com/education/2017/5/31/rhino-grasshopper

Most questions have been asked and answered online in the user groups. You will likely need to find help here at some point.
http://www.grasshopper3d.com

~~V-Ray~~ (Lumion is the future it seems…)
Primary Site
http://www.chaosgroup.com/en/2/index.html

Lynda Tutorial: Architectural Rendering with Rhino and V-Ray with Dave Schultze (Great USC Resource!)
http://itservices.usc.edu/lynda/

Statement on Academic Conduct and Support Systems

Academic Conduct:
Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, "Behavior Violating University Standards" https://policy.usc.edu/scampus-part-b/. Other forms of

academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct.

Support Systems:

Student Counseling Services (SCS) - (213) 740-7711 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. https://engemannshc.usc.edu/counseling/

National Suicide Prevention Lifeline - 1-800-273-8255
Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. http://www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 - 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. https://engemannshc.usc.edu/rsvp/

Sexual Assault Resource Center
For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: http://sarc.usc.edu/

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086
Works with faculty, staff, visitors, applicants, and students around issues of protected class. https://equity.usc.edu/

Bias Assessment Response and Support
Incidents of bias, hate crimes and micro-aggressions need to be reported allowing for appropriate investigation and response. https://studentaffairs.usc.edu/bias-assessment-response-support/

The Office of Disability Services and Programs
Provides certification for students with disabilities and helps arrange relevant accommodations. http://dsp.usc.edu

Student Support and Advocacy – (213) 821-4710
Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. https://studentaffairs.usc.edu/ssa/

Diversity at USC
Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. https://diversity.usc.edu/

USC Emergency Information
Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible, http://emergency.usc.edu

USC Department of Public Safety – 213-740-4321 (UPC) and 323-442-1000 (HSC) for 24-hour emergency assistance or to report a crime.
Provides overall safety to USC community. http://dps.usc.edu