ARCH 6501: Analog – Digital Design Computation
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T-R: 1:35PM – 2:55PM
COA West 259
Georgia Institute of Technology
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ANALOG – DIGITAL DESIGN COMPUTATION

An advanced examination of the shape grammar formalism and its relationship to akin ideas in a variety of other fields, including art, philosophy, history and philosophy of science, linguistics and psychology, literature and literary studies, logic and mathematics, and artificial intelligence. The class builds upon a working distinction of representation systems in architectural design in terms of analog and digital notational systems and explores their affinities and differences to visual and symbolic systems of representation respectively.

Students are expected to read the weekly readings, participate in the weekly discussions, write a brief synopsis of papers read, produce a design study to illustrate ideas discussed in the class, and prepare a final project in the form of design study, a paper or a slide presentation.

The course is open to M.Arch, MSc.Arch and PhD students with an interest in formal (spatial / mathematical) analysis and composition. Undergraduate students can take the class with a special permit.

Course procedure and organization

The class is divided in three parts. The first past opens with a detailed discussion of languages of design of architectural form, their specification in terms of formal grammars, and their role in structuring design thinking. The readings associated with this part of the course are selected from Mitchell’s “The logic of Architecture”. The second part focuses on shape grammars, a generous formal system for the generative description of design, and in particular in the design schemas and the ways schemas are ordered and combined to produce a compositional taxonomy of design. The objective of this part of the course is to produce pictorial illustrations of the basic schemas, their inverses and their combinations in sums and products, in terms of symbolic rules, shape rules, parametric rules and graphic examples. A pictorial essay will conclude this inquiry, to foreground the significance of schemas as abstract compositional procedures that can be used in a variety of ways. The readings structuring the discourse for this part are selected from Stiny’s “Shape: Talking about Seeing and Doing”. In the third part, the emphasis is given in the broader theoretical relationships of the design schemas and the shape grammar formalism at large, to other domains in other fields. This part of the course will be student led and will be based upon the outcomes, claims and ideas discussed in the first two parts of the course. Suggested authors/readings to be
presented and discussed include Kandinski, Klee, Alexander, Chomsky, Simon, Goodman, Schon, Rorty, and several others.

**Course requirements**

Students are expected to read the papers, write brief summaries, participate in discussions, and produce two projects in the form of pictorial essays or slide presentations. The summaries of the papers will be produced prior to their discussion in the class and they will suggest the indexing of the main ideas of the paper in three categories: agreed; disagreed; and uncertain/ambiguous. The two pictorial essays or slide presentations will be based on readings given in the class and their main purpose is to show a clear understanding of the ideas presented in the papers and to guide the discussion in the class. The grade for this course is divided in the following sections:

- Attendance / Participation: 10%
- One-pager précis: 10 x 3% = 30%
- Pictorial essay: 30%
- Final project: 30%

**Evaluation Criteria / Policy on Absences**

Attendance, participation, timely completion of work, depth of engagement, craftsmanship and completeness in all submitted work. More than three unexcused absences result in a letter grade reduction.

**Required Readings**


**Suggested Readings**

A selective list of readings from a wide range of disciplines relevant to the concepts and ideas of shape grammars is given below.

*Art and Design*


Reuleaux Frantz, 1963, *The Kinematics of Machinery: Outlines of A Theory of Machines*


*Philosophy*


Putnam, Hilary, 1987, *The Many Faces of Realism* (Open Court, La Salle)

Quine, Willard, 1953, *From a Logical Point of View; 9 Logico-Philosophical Essays* (Harvard University Press, Cambridge, Massachusetts)


History and Philosophy of Science
Feyerabend, Paul, 1988, Against Method, Rev. Ed (Verso, New York)
Hanson, Norwood Russell, 1958, Patterns of Discovery: An Inquiry into the Conceptual Foundations of Science (Cambridge University Press, Cambridge, Massachusetts)
Kuhn, Thomas, 1962, The Structure of Scientific Revolutions (University of Chicago Press, Chicago)

Linguistics and Psychology
Chomsky, Noam, 1965, Aspects of the Theory of Syntax (MIT Research Laboratory of Electronics, 11)
Chomsky, Noam, 1965, Syntactic Structures (Mouton, Hague)
Lakoff, George, 1987, Women, Fire and Dangerous Things: What Categories Reveal about the Mind (Chicago University Press, Chicago)

Literature and Literary Studies
Fish, Stanley, 1980, Is there a Text in this Class? The Authority of Interpretive Communities (Harvard University Press, Cambridge, Massachusetts)
Fish, Stanley, 1989, Doing what Comes Naturally: Change, Rhetoric, and the Practice of Theory in Literary and Legal Studies (Duke University Press, Durham)

Logic and Mathematics

Computer Science
Winograd Terry, and Fernando Flores, 1987, Understanding Computers and Cognition: A New Foundation for Design (Addison-Wesley, Reading, Massachusetts)

*Web references*

www.shapegrammar.org
http://www.mit.edu/~tknight/IJDC/frameset_abstract.htm
http://iaaa.nl/cursusAA&AI/stiny.html