GSAPP Fall 2014 - VISUAL STUDIES WORKSHOPS

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Session A: A4524 - Topological Study of Form

Jose Sanchez Thursday 6-8pm 114 Avery

Architectural form has traditionally been implemented neglecting the mathematical substratum of post-Euclidean geometry. With the advent of advanced time-based computer modeling techniques, architects are able to embed quantifiable data into the architectural design process. The inherent dynamics of the architectural program can therefore generate both, traditional relationship diagrams and form. Since these diagrams carry the ever-changing programmatic behavior of a building, generative geometry derived from diagrammatic programmatic connections allows designers to generate and drive geometrical formations. Traditional line-based systems can also generate a structure of forms that incorporate architectural space-form relations. Based on this approach to design, morphology can be studied using the time-based mathematical models inherent in modern software-based digital tools.

The first half of the class will start with an introduction of Polygon tools, NURBS tools and procedures use in form making for industrial design. From the industrial design introduction, we will focus on the topological study of form using anamorphic time-based geometry tools. Following recent developments in software simulation of physics and topology, we will study particles and fluids as morphological systems with volumetric characteristics, as opposed to following the normative approach of regarding fluids as just vector systems. Also, we will analyze how the generative morphological behavior of Fractals can generate 'structures' of form that incorporate space-form relation. Finally, we'll study the "design" of a material using Maya's nCloth system, which allows for a mesh to have structural behavior by assigning material properties to its topology.

Session A: A4534 - Techniques of the UltraReal

Joseph Brennan and Philip Crupi Monday 7-9pm 600 Avery

Description
The use of perspective and rendering is often an afterthought. With the abundance of 3D modeling software and the ability to see every angle of a project instantaneously, renderings are often a last minute tool for representation. This class challenges the participants to not only think of rendering as a method of presentation, but also a tool for design. We encourage the use of perspective and rendering early and often in the process. In addition to learning techniques for creating ultrarealistic renderings, we will teach a workflow that encourages early exploration. We will focus on color, light, material, context, reflection, and opacity throughout the course of the entire design. We will look for inspiration in many places, including photography and cinematography.

The class will use V-Ray for 3D Studio Max as the main engine for exploration, but will also encourage the use of other modeling applications, post processing software, and 3rd party plug-ins. No knowledge of V-Ray is required, but students should be able to model in an application of their choice (Rhino, Maya, etc.)

Each class will consist of a lecture, followed by a software demo. Other instructional video tutorials will be found online at digitalconceptsnyc.com. There will be additional required working sessions and desk crits with critics and assistants.

Session A will start to explore the basic aspects of the rendering process, including but not limited to modeling, cameras, lights, and material. Session B will expand on these ideas and delve deeper into each aspect, as well as introduce additional techniques. Students who take session B are **highly encouraged** to take session A.

Session A: A4676 - Architectural Photography 01
Erieta Attali   Friday 9-11am 200 Buell

The scope of this course focuses on using the medium of architectural photography as a critical tool for analyzing and representing buildings. By contextualizing and framing the relationship between an architect and his or her work, it becomes easier to understand the intent behind the design process. Architectural photography helps us to understand the creator's ideas and intentions, and can provide us with insights into a building's meaning. It provides us not only with documentary evidence but also serves as a stimulant for the critical mind. On a practical level, the class teaches soon-to-be architects what to expect and what to desire from documentation of buildings they might design in the future.

Professor Attali leads each class as an open critique tailored to individual strengths and interests. Students are expected to produce work for every class for review. By the end of the semester, students will ideally build up a portfolio of work centered around an individualized project. The class also incorporates the work of past and contemporary landscape and architectural photographers, drawing from their example and talent for inspiration. Photo I is largely an introductory course, while Photo II delves more thoroughly into the discipline and also begins to explore night photography.

Basic knowledge of photography is encouraged, but not required. You can use any type of camera you'd like, whether it's an SLR or a simple point-and-shoot. Shooting digital is not required, but highly recommended as you will be expected to present a large body of work each week, and developing film would be very costly as well as time consuming.

Session A: A4711 - Search: Advanced Algorithmic Design
Mark Collins and Toru Hasegawa Tuesday 6-8pm 200 Buell

Architects work with computers every day but rarely achieve a true synthesis of machine automation and human design thinking. This workshop promotes simple, visual programming as a vehicle for designers to take their ideas to the next level. How do we do this? By collaborating with the computer at its most potent level: code.

We teach programming through a series of workshops, competitions and project work. We work in Processing, an open source programming environment created for visual thinkers working in two and three-dimensional media.

Design computation encompasses a broad range of approaches and techniques. Using object oriented programming and Processing as a starting point, the seminar explores the practice and promise of these new means of design conception through a process of experiment, play and re-wiring. These workshops support a focused research led by the student in the exploration of an emerging topic or technology in design computing. The results of the class are visualizations that reveal the hidden algorithmic logic at work inside each code.

Object-oriented programming (OOP) is a crucial part of the seminar's approach to algorithms. Object oriented programming gives us a rich, flexible language to model complex systems and visualize their outcomes. Each student will develop a series of custom objects that interact and extend the objects introduced through workshops and 3rd party libraries (i.e. for interacting with Kinect, GIS, video, mesh generation).

The seminar promotes the notion that design through computation is necessarily a search process. Generative computing brings with it entirely new ways of solving problems and new modes of expression. It also brings new challenges in managing the torrent of design information that one can generate. The seminar will introduce key terms and concepts within each workshop addressing issues such as design solution space, emergence, and artificial life to critically assess our role as both actors and objects in this new reality.

No programming experience is required.
Please see www.proxyarch.com/wiki for previous work and more information

Session A: A4715 - Re-Thinking BIM
John Lee and Brian Lee Thursday 5-7pm 202 Fayerweather

What is the place of BIM in architecture? Is it only meant for production, or can architectural design benefit from the real time feedback of Building Information Models. BIM can, and will change the profession--this generation is responsible for how that will be. Not having to deal with professional demands, students in this course will be able to explore BIM strategies which in the workplace are not possible. These virtual buildings are requiring that architects be extensively aware of all aspects of design. The intention of this workshop will be to develop a thorough understanding of BIM, most importantly how can we intervene in the BIM process to not let it be strictly about efficiency, but instead utilize its capabilities as opportunities for design. How is the time gained from these tools re-appropriated? How can the concepts of parametric modeling infiltrate, magnify, and redefine the design process? Using software that forces rigor, can we learn from it and re-apply those logics to other aspects of what we do?

Often out of familiarity, Architects favor one design medium over another. This workshop will insist on interoperability between various platforms, magnifying the strengths of each tool. We will investigate the process of integrating multiple parametric platforms simultaneously into a single architectural project. Students will use Autodesk Revit, Autodesk Vasari, 3DS Max, Rhinoceros and associated plugins, to create a parametric architectural system with embedded variability. A direct relationship with Autodesk has been established which allow for an exchange with the software developer.
Requirements:
- Intermediate knowledge of at least one or preferably two other 3dmodeling programs
- Attendance of lecture and tutorials
- Tutorial assignments(6)
- Individual projects(1)

Schedule:
WEEK 01 (09/05) - Lecture // BIM & Parametric Relationships, Project Introduction
WEEK 02 (09/12) - Lecture // Basic Revit Tools
WEEK 03 (09/19) - Lecture // Custom Component & Design Options, Project Proposal
WEEK 04 (09/26) - Lecture // Adaptive Components, Nesting, and Panelization
WEEK 05 (10/03) - Lecture // Advanced Panelization
WEEK 06 (10/10) - Lecture // Data Management, Documentation, Rendering & Viz
WEEK 07 (10/17) - Help Session // Desk Crit

Full Semester Course: A4716 – Graphic Architecture Project I: Design and Typography

Yoonjai Choi Wednesday 9am-12pm 408 Avery

In this class we examine, in minute detail, the visual rhetoric employed to convey design concepts. Typography is fundamentally the procedure of arranging type, but it can also be the particular art of traversing meaning with form. In addition to developing a general typographic fluency, we will consider the visual tone of how messages are conveyed, and explore ways to appropriately control and manipulate that tone through typography.

We also investigate conceptual issues through a series of extremely practical assignments drawing on historical standards as well as contemporary examples of graphic design. Our ultimate goal is to establish a shared verbal and visual lexicon with which we can create, and critique, graphic work and to align conceptual intent with visual results.

Full Semester Course: A4717 - Graphic Architecture Project II: Strategic Images

Terri Chiao Wednesday 9am-12pm 505 Avery

As a complex form of drawing, the designed image transforms new or invisible concepts into relatable form. It creates new realities; an imagined world in the mind of the viewer; a fertile ground for receiving new ideas. In this class we look critically at image-making in an age of outsourced digital production, asking questions such as: What makes an image compelling? What is the relationship between image and built form? How can we design images that communicate fundamental architectural ideas?

Set up in two parts, "Looking" and "Making", we begin by researching the image oeuvre of influential architects from the last century and move on to creating and critiquing our own images in a set of exercises: sketch, diagram, photomontage, collage, and model.

Full Semester Course: A4726 – Graphic Architecture Project III: Graphic Narratives

Michael Rock and Oana Stanescu Wednesday 9-11am 300 Avery

Narrative is derived from the late latin narrativus : telling a story. This class focuses on the imposition and implication of narrative in explaining and presenting architectural projects. We look at both synchronic and diachronous aspects of narrative and consider the effect of media on story. The class is designed to learn by doing therefore the emphasis will be on a number of short exercises that must be completed specified time. Through these short projects, we consider the implication and meaning of graphic imagery and language without overlooking formal issues such as color, balance, sequence, and composition.

Session A: A4718 – Cinematic Communication

John Szot Thursday 8-10pm 114 Avery

Digital video is an excellent tool for expediently gathering rich information about our surroundings. However, its raster format poses a distinctly different kind of challenge (relative to vector-based formats) when it comes to precise studies and accurate simulation of physical phenomena.

This workshop focuses on digital video as a tool for dissecting and reinventing the physical environment. It is designed to introduce students to the architectural potential within the advanced features of Adobe Premiere and basic functions of Adobe After Effects. Presentations and discussions throughout the workshop are organized around two brief assignments that will cover advanced pre-production techniques, advanced motion graphics, and basic compositing techniques.

Format:
The students will prepare short films to fulfill assignment requirements after receiving technical and theoretical instruction on various aspects of video production. After the first class day, sessions will alternate between the presentation of technical material in the form of workshops and screenings of student work side-by-side with class discussion of concepts related to the class topic.

Coursework:
The semester is divided evenly between 2 assignments. Daily sessions will include technical presentations on the basic functions of each software package as applicable to the current assignment and group discussion in which completed assignments will be critically analyzed and evaluated.

Session A: A4747 - Parametric Realizations

Mark Bearak and Brigette Borders Monday 7-9pm 115 Avery

Parametric Realizations: exploring the intrinsic relationship between parametric algorithms and material explorations

Overview
Parametric modelers are commonly used in the development of digital architectural models, but they are rarely taken to the point of becoming physical realities. This course will look at the process of generating parametric algorithms then turning those models into physical realities. Students will work in groups to design an installation that will be the physical realization of their scripted protocol.

Project
Students will work in groups to design an installation that will be the physical realization of their scripted protocol. Groups will develop mathematical algorithms using parametric modelers such as Rhino.script, Grasshopper and Generative Components. Concurrently students will be testing modeling techniques in order to create a prototype for their final physical system. Students will then take their digital models, rationalize them, and physically construct the system using a material process from their prototype.

Implementation
Students will start by researching certain room typologies such as wall panels, lighting elements and furniture pieces; each group will choose an element that will be used as a seed for their scripted cells. Students will use parametric modelers to generate their individual cells while keeping in mind the constraints of physical materials. Over the course of the semester students will apply specific techniques to differentiate their cells in order to create a series of distinct modeled elements. While students are developing their differentiated cells they will start testing their proposed modeling technique based on a single modeled cell. Students will streamline the modeling techniques that will generate a 1 to 1 prototype of one of their cell.

Session A: A4753 - Special Topics in Fabrication: Design Machine

Josh Draper and Eric Hagan Tuesdays 7-9pm 115 Avery

Overview

Digital Fabrication has revitalized the idea of the Architect as Maker. While new software and workflows have made digital fabrication accessible, its potential to intervene in practice is only fully realized at the level of the CNC machine. What might become possible if Architects designed and built their own machines? Agendas involving material, performance and computation could be embedded instead of inherited. New architectures could become possible when control extends to this foundational level.

Formworks is a Visual Studies Digital Fabrication course which combines casting with computational techniques through the production of a *Design Machine* - an original and specific CNC machine. Using the Firefly plug-in for Grasshopper, the Arduino microcontroller and servo devices such as stepper motors and linear actuators, students will make their own CNC machine from the ground up to produce a system of non-repetitive castings.

Formworks will be staged in two sessions over the semester. Students are strongly encouraged but not required to attend both sessions. The first session, *Design Machine,* introduces students to mechatronics techniques using Firefly, Arduino and two basic servo devices - stepper motors and linear actuators. Students will make a prototype servo device, which forms the basis of a larger system, to mechanically and computationally demonstrate a system of non-repetitive but parametrically related castings. In parallel, students will be introduced to various casting techniques. The second session, *Field Fabrications*, will iterate the prototypes, producing a larger array of robust servo devices. Full castings will be made using the system. The course will focus on pre-cast curtain walls to maximize the graphic qualities of the process.

Session A: Design Machine

Beginning with an introduction to the machine in Architecture and Design, students will research and present projects that deployed, or actively employ, computational mechanisms in their design and/or operation. We proceed with an introduction to Physical Computing and Mechatronics, using the Firefly Grasshopper plugin to control a stepper motor and develop a vocabulary of rotational moves and states which are simultaneously represented by and controlled through Firefly and Grasshopper. Linear actuators, which use embedded stepper motors, are introduced. Translation is added to rotation in the kit of moves. The prototype *Design Machine* emerges, using a propagated array of rotations and translations to manipulate a formwork membrane. Students propose a system of castings which each maps a different state of the formwork membrane. In parallel, we investigate physical casting techniques and materials and inform the *Design Machine* process

Session A: A4778 – METATOOL I
Dan Taeyoung   Thursday 5-7pm 300 Buell North

"The user of the electric light -- or a hammer, or a language, or a book -- is the content. As such, there is a total metamorphosis of the user by the interface. It is the metamorphosis that I consider the message."

Marshall McLuhan

The architect encounters a site. Armed with an arsenal of tools, she undergoes processes of observation, research, and analysis. These operations unearth constraints and situations, which in turn define the field of possibilities in terms of space, event, and movement. Other tools allow her to sketch, improvise, represent, modify, analyze, critique, and explore this field. And over a long process of deliberation, introspection, and collaboration, she arrives at a singular decision that creates a new kind of site and a new context altogether, when set in motion.

It goes without saying that the architect's tools are her most prized possessions. They are akin to bodily prostheses: new augmentations that not only alter what can be done, but what can be represented and thus what can be conceptualized. It could even be said that the architect is indelibly influenced by the logic and agency of those tools.

This critical architect might ask: Where does the tool come from? What does the tool want to do? What new tools can be created? Should not every process of design be one that reinvents new methods of thinking, and new tools for creation? **In other words: Architects should not only be able to *use* tools, but should have the ability to *create* new critical / experimental design tools.**

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METATOOL is a course about designing experimental design tools, utilizing the Grasshopper software environment as a meta-tool: a tool that enables the creation of other tools.

The course is grounded in a solid technical understanding of Grasshopper and hovers around a set of critical history/theory texts and group discussions. Each new experimental tool will result from an examination of an existing design tool, and will be oriented towards the creation of a new design process within Grasshopper (with the optional integration of Python/C#/VB.net).

Knowledge of Rhino is assumed, and a basic knowledge of Grasshopper is recommended, but not necessary. A database of Grasshopper introduction videos, developed in conjunction with the ADR2 curriculum, will be available. A custom created Grasshopper component, Hairworm, will be used in conjunction with Github, a cloud-based platform for sharing code. The course will be the starting seed for the Grasshopper Exchange, a new online-based tool arsenal. Over the duration of the course, students will collectively amass this shared database or 'arsenal' of new Grasshopper-based tools into a suite of experimental design processes that will enable and augment new, experimental design possibilities.

Session A: A4798 – Craft in the Digital Age

Nathan Carter Thursday 5-7pm   Fabrication Shop (1st Floor, Schermerhorn Ext.)

What is the role of craft in architecture?
The skills of the architect are now dedicated to the digital. The making and testing of a project can take place entirely in the computer, but without an intimate understanding of materials and techniques of making, the architect's digital work has limited efficacy.

Making and testing belongs within the larger feedback loop of design.

The aim of the class is twofold:

-To explore craft, developing a personal understanding of materials, tools, and techniques to directly inform the design process.

-To frame this exploration in a larger context of analog and digital design and fabrication, highlighting efficiencies and limitations, and rethinking the orchestration of the two by the designer.

The class is structured around weekly, hands-on exercises in the Fabrication Shop. Students will become proficient with a number of tools, and we will test construction and joinery techniques. We will discuss tolerances, material properties/constraints, and work-flow/logic.

During the semester, students will design and fabricate Seating Units (SU). Each Seating Unit will be made of wood and must support one person sitting. Additional criteria will be given for each assignment. Students may work in pairs if desired. Students will bring their SU to the next class along with drawings that explain the assembly process and potential aggregation schemes for making and deploying multiple Seating Units.

The final project is to design and fabricate a multi-person Seating Unit that demonstrates an understanding of materiality, tools, and techniques developed from our exploration of craft. This could be one piece at a larger scale that accommodates multiple people, or it could be a development on the aggregation of multiple single person Seating Units.

Outline of Class:

Week 01: Saws and Wood Joinery
Assignment #1- Make one Seating Unit with no fasteners
Week 02: Drills, Routers, and Fasteners
Assignment #2- Make one Seating Unit that can stack, nest, collapse, or transform
Week 03: Hand Tools and Jigs
Bring Assignment #1 to class
Week 04: Lamination, Gluing, and Clamping
Bring Assignment #2 to class
Assignment #3- Sketch ideas of 3 possible final projects
Assignment #4- Make one laminated wood component
Week 05: Wrap up lamination project and discuss final assignment
Bring Assignment #3 (sketches) to class
Assignment #5- Make a scale mock-up of final project
Week 06: Final project work session
Bring Assignment #4 (laminated component) and #5 (scale mock-up of final) to class
Final Assignment

Final Review

Full Semester: A4801 - Encoded Matter: Workshop in Computational Craft

Ezio Blasetti Tuesday 1-3pm 408 Avery

code.algorithmicdesign.net

This workshop will be devoted to the design and prototyping of architectural immersive environments via computational generative methods. At present computational techniques are predominantly employed in the optimization, rationalization or surface decoration of more traditionally created forms and spaces. This research rather, will focus on the inherent potential of computation to generate space and of algorithmic procedures to engage self-organization in the design process. Participants will engage closely with computational processes in order to develop an aesthetic and intuition of complexity that resides in a balance between design intent and emergent character. During the workshop, participants will work in small teams and create their own custom algorithms appropriate to the research trajectories of choice. The output of the workshop will be a series of boards, prototypes and animations.

"Encoded matter" will run primarily under python programming language for Rhinoceros 3D 5.0, Grasshopper & Autodesk Maya. The application of python as the cross-software coding platform opens up a new set of possibilities for the development of cutting edge techniques of digital representation, abstract and spatial organization as well as intricate geometric precision for robotic fabrication. "Encoded matter" will test python for rhinoceros/maya in an intensive format and will seek to produce innovative intersections between advanced explicit modeling and algorithmic logics.

The focus is not merely on a demonstration of proficiency in various skills and techniques, but rather the positioning of the project as a contribution to the larger architectural discussion, which supports the value of computational craftsmanship methodologies. The critical parameter in this workshop will be to develop the potential beyond finite forms of explicit and parametric modeling towards more non-linear algorithmic processes. This workshop will accommodate both introductory and advanced levels. No previous scripting experience is necessary. It will consist of a series of introductory sessions, obligatory intensive workshops, lectures followed by suggested readings, and will gradually focus on individual projects.

The seminar is organized into a series of topics, some of which will be covered in the tutorials, and others that will suggest potential areas of student research. "Encoded Matter" is seeking to propose a parallel study between material behavior and computational systems. The materialization of the research is non-linear: the computational system is not predefined with a singular fabricated manifestation. The participants will be encouraged to conduct and document a series of material 'experiments' in dialogue with their computational research.

Workshop Session I: Algorithmic and Material Analysis & Self-Organization
This session will look closely in parallels between the animate behavior of matter and the emergent phenomena in simple software. Algorithmic procedures will be developed for the analysis and simulation of analog experiments. The output will aim at two and three dimensional drawings as well as animations that capture the expressive character of the self-organizing system in question.

Workshop Session II: Non-Linear Computational Tectonic Language
The second session of encoded matter will build upon the research developed in the first half. Students with prior scripting knowledge are welcome to participate regardless if they enroll in the first session. The tutorials will focus on advanced algorithmic techniques oriented towards metaheuristic methods and non-linear combinatory systems for design. Participants will work towards the development of a research specific tectonic language. These investigations will lead to the design of a temporary construct/pavilion through constant feedback between programming and prototyping.

Session A: A4819 – Site to Site – Site to Web
Troy Conrad Therrien and Chris Barley Thursday 7-9pm 300 Buell North

Architecture is online. Recent achievements in ubiquitous computing, machine intelligence, deep learning, ambient locative media, mobile and embedded devices, machine to machine systems and other forms of the "Internet of Things", coupled with the proliferation of cheap networked sensors and actuators has brought us to a moment in which architects no longer have the comfort of speaking of connected environments in the future tense. The technology for connecting and orchestrating physical spaces digitally are not simply accessible, they have become pedestrian. And still they have yet to fully penetrate either the architectural imaginary or the space of architecture production. This course aims to do both simultaneously.

Methdology
The course will proceed reflexively. We will investigate the necessary means for designing, representing and analyzing architecture online by producing them and using them ourselves in the process. Specifically, we will build a platform for putting architecture online, a collection of networked sentient objects and the protocols and standards that will allow them to communicate digitally with one another and spatially and organizationally with architecture. Unlike the hoards of tech behemoths and start-ups vying to become the platform for this coming wave of techno-social-spatial renewal, we will integrate the languages of technology with architecture. We will collaboratively design and implement a public application programming interface, an API, that integrates architectural representation with technical protocol.

Partnerships: Venice, Office*US*, Studio-X, Experts
We will partner with the seminar "Corporate Avant Garde" (A6453) in taking a hypothetical construct as our object: the US Pavilion in Venice as the site for a hypothetical architecture office, Office*US*. In addition to shared sessions and objectives, we will likewise consider the future of the architecture office as a multifarious space, as part-studio, part-gallery, part-event space, part-publication house, part-factory, part-school, and other parts as yet unknown. We will use Studio-X locations to test our work in a globally distributed network, allowing us to consider questions of culture, language, time, and other misalignments, and to insert our work into a live architecture discourse and practice. In parallel, we will work with a group of technology experts who are responsible for some of the major advances in the field we will enter.

Session A
In Session A, students will design and build the furniture, climate control, lighting, and display systems, surfaces, and other objects to address one or more segments of the above programmatic spectrum of Office*US*. Powered by a $35 Raspberry Pi mini-computer running Node.js on the Linux operating system, these objects will produce and consume digital information, collecting information about and/or producing effects in their environment. Students will also design the technical protocols and representation systems for tapping into these inputs and outputs.

This initial iteration of the platform - objects and their interfaces - will be tested at the end of Session A with a final review in the form of a hackathon. We will invite expert programmers and designers for a day-long event at Studio-X NYC to tap into the platform with the students and both build applications on top of the platform and help to improve the platform itself.

Technology Stack
The technology stack of Raspberry Pi mini-computer powered by the Node.js application/web framework provides a favorable learning curve. The only required programming language for the course is Javascript, a front-end web programming language that Node.js allows to control intensive back-end processes. Javascript is both the most common used language in open source projects, and continues to grow for its combination of power and ease of use. In short, you've likely seen it, maybe even used it, and we are going to teach you to be a Javascript ninja by the end of the course. You will use it to control web servers, to construct a robust RESTful and streaming API, to tap into cutting edge NoSQL databases, connect to a battery of andalog and digital sensors, cameras, microphones, LEDs, servo motors, and a seemingly endless array of other input and output mechanisms.

Collaborative Infrastructure
We will also extensively employ Github in our entire process. Since its founding in 2008, Github has fueled the explosion of open source projects and online collaboration. We will use it to incorporate a lean, iterative design methodology including cloning, forking, pushing and pulling to produce a clean means of collaboration in small groups and as a large class. You will determine new ways for architects to incorporate this process into their design practice, and will likely choose to use the method for a number of other tasks going forward, as so many users have.

Session A: A4832 – Lines Not Splines: Drawing is Invention

Christoph a. Kumpusch, PhD Monday 7-9PM 300 Buell North

"Drawing is not the form; it is the way of seeing the form." Degas

"To draw does not simply mean to reproduce contours; the drawing does not simply consist in the idea: the drawing is even the expression, the interior form, the plan, the model. Look what remains after that!" Ingres

This intensive workshop-formatted course is rooted in three propositions: that drawing is as much a way of seeing as it is a means of representation; that drawing is not bound to digital versus analog categorizations; and that drawing remains the primary vehicle to record, communicate and create architecture.

We will review the "Top Twenty Great Architectural Drawings" as a series of case studies linked to a film project on the drawing process. We will attempt drawings of one line and drawings of 1,000 lines in the same spans of time. We will draw what we see, what we cannot see, what we want and what we wish we could achieve. The word "rendering" will have NO place in this seminar. A series of readings will augment class assignments and discussions.

Students are expected to surrender their typical drawing habits in favor of a rigorous drawing routine which will challenge notions of style, assumptions about "start" and "finish," ideas about surface, shadow and scale. Diverse media will be deployed, subjects will include studio work, urban fragments, body parts and inward visions. Students will leave the course with sore hands, bright minds and a thick portfolio of new work.

SCHEDULE

Session 1: Introduction: Turn Off the Lights! Turn on the Lines!
We will begin this module by watching a purpose-built film on the art and action of architectural drawing. Following this, we will hold a roundtable to discuss its points and evaluate the range of "drawing" as a creative practice par excellence.

Session 2: Workshop
We will conduct a series of equally timed drawings: one of 1000 vectors, one of 100, one of 10 and one of 1. Density versus dexterity. Notions of intent. You will then be asked to make "models" of these four drawings with frames and string in an effort to see the depth of your construction.
Reading: Michael Graves. Architecture and the Lost Art of Drawing (New York Times, 1 September 2012).

Session 3: Drawing-Model Review
You are asked to pin-up photo essays representing your models (but not present the models themselves). Alongside each of the four, you will generate a text of 1000, 100, 10 and 1 word(s), respectively to describe the stance and affect of your models as documented.
Reading: Nicolas Olsberg. THE EVOLVING ROLE OF THE DRAWING (The Architectural Review, 23 April 2013)

Session 4: Top Twenty Countdown
You will present twenty single drawings from the span of architectural history to the present that you deem "great." You should develop a rubric for your thinking, a methodology of judgment that you can share with the class.
Reading: Lebbeus Woods. MICHELANGELO'S WAR (as featured on lebbeuswoods.wordpress.com)

Session 5: Night Drawing
We will conduct a series of urban profile/edge drawings in an around campus in the dark of night. How do you represent what is fading or invisible? How can drawing mitigate the darkness? What media are appropriate to night drawing? You will videotape each other Night Drawing and edit these into 1-minute mini-documentaries.
Reading: Henri Zerner. Likeness / Warhol / Drawing (essay provided in class)

Session 6: Self Portraits
What is an architectural self-portrait? What is an architect's self-portrait? How might we merge the two into an image that collapses your own body and your own current studio work? What role does your body play in the crafting of your work, how can its movement, measure and management of form be represented graphically?

Session 7: The Shortest Film Festival Ever
We will review your Night Drawing films, which should feature an original sound track overlay in concert with your footage. A final pin-up of your Self Portraits will follow.

Session A: A4834 – Datamining the City I: Culture, Urbanism, and Web 2.0

Danil Nagy Thursday 3-5pm 300 Buell North

- *What can we learn about the city given the massive amounts of data present on the internet?*
- *How do we utilize new software tools to extract, gather, and process this data?*
- *What new sources of data can we uncover, and what will this tell us about our cities?*

Description:

This seminar will focus on developing strategies for datamining large datasets from the web and processing them spatially to derive new knowledge about the city. Lectures will provide students with a theoretical and historical basis for this kind of research, as well as training in the specific tools that will be used. The class will take a hands-on workshop approach to teach practical skills in basic programming, web scraping, big data, GIS, and visualization. The main tools will be *Python* and *QGIS*.

The context of the research will be the Pearl River Delta in China, the world's largest megalopolis containing at least 60 million people. The research will focus on urban issues that have been difficult to research using traditional data and tools, including migration, informal housing, and grey market economies.

Students will be provided with an initial set of data, but will be expected to gather and process additional data sources to supplement their thesis. The class will be divided into groups to produce 4-6 projects, with each group expected to fulfill the following requirements:

- Generate a proposal or <u>hypothesis</u> for research based in the Pearl River Delta
- Create custom scripts to collect, organize, and <u>process</u> this data
- Spatially analyze this data to create a <u>model</u> within a GIS
- Create provocative visualizations that <u>demonstrate</u> some conclusion about the chosen issue.

Schedule
Session A – Introduction to Python, web scraping, data gathering and analysis

Week 1 Big data, micro-informatics, and the Pearl River Delta
Week 2 Python for basic data processing
Week 3 Python for data gathering, web scraping and API

Week 4 Basic QGIS for visualization
Week 5 Advanced QGIS I – processing and spatial statistics
Week 6 Advanced QGIS II – analysis using heat maps, interpolation, and time

* since the class will be based around a group research project, students are highly encouraged to register for both sessions A and B

Full Semester: A4837- POST PARAMETRIC: Futures of Computing and Design

David Benjamin Wednesday 11am-1pm   412 Avery

OVERVIEW
In February 2011, following six years of cutting-edge research on **artificial intelligence** at IBM, a computing system named Watson defeated two human champions in the game show Jeopardy.

In May 2010, after 30 years of steady growth in **algorithmic trading**, hundreds of unnamed computers ordered a flurry of trades without human input and caused the United States stock market to lose 9% of its value in five minutes.

Autonomous algorithms have steadily expanded their reach in the past ten years and they now influence numerous aspects of our lives, including architecture and our built environment.

At the same time, recent developments in other advanced algorithms—such as those for **cloud computing**, **directable simulation**, **self-modeling buildings**, **evolving robots**, **personal supercomputing**, **open source visual programming**, **real-time adaptation to sensor data**, **computer vision**, **predictive analytics**, and **bio-computing**—are forging new paths for our buildings and our cities.

In this context, Post Parametric aims to **question, broaden, and re-frame the way we think about computing and design**. It looks beyond the current moment and its ambiguous buzzwords—but not so far ahead as science fiction—and it explores how we might be using algorithms in the design of buildings ten years from now.

RESEARCH + DESIGN
This technology elective combines the seminar/research format and the workshop/design format. It will include **research and discussion** as well as **hands-on experimentation** with new algorithmic techniques and the creation of a final design project.

The research portion of the class will involve a close study of several next-generation computation tools and projects. Students will select an individual topic, make a presentation to the class, and lead a group discussion on the topic.

The design portion of the class will involve the application of next-generation computation tools to a design project. Students will work individually or in small teams to select a topic, identify a hypothesis, and test the hypothesis through an immersive flash design project. The design project may be applied to a concurrent studio project, or it may be an independent exploration. Possible topics include:
   + **Evolutionary computing** (ModeFrontier, Galapagos, other)
   + **Microprocessing and robotics** (Arduino, sensors, Processing, other)
   + **Computer drawing** (Processing, Javascript, other)
   + **Information modeling** (Grasshopper, CATIA, other)
   + **Digital simulation** (Ecotect, Robot, SolidWorks CFD, other)
   + **Cloud computing** (Amazon EC2, Autodesk 360, other)
   + **Bio computing** (BSim, Formulize, DNA Origami/CADnano, other)

NOTES
For students who are interested in the **Living Architecture** class from the Visual Studies sequence, this class will allow for the opportunity to learn similar techniques and design similar interactive projects—but here they will be framed in a broader context of next-generation computation and design.

Work from this class will have the opportunity to be published in a **forthcoming book** alongside contributions by ground-breaking computer scientists and designers from the **MIT Media Lab**, **Columbia Department of Computer Science**, **Cornell's Creative Machines Lab**, **Autodesk Research**, **Bentley Systems**, **NVIDIA**, and **IBM**.

This class grows out of a series of events held over the past three years in Wood Auditorium and organized in collaboration between Columbia Graduate School of Architecture, Planning and Preservation, and Columbia Department of Computer Science. This series brought leaders and innovators in many fields to GSAPP to discuss the **next generation of computing in relation to design**, and the class will build off of the ideas and tools presented in this series.

Session A: 4815 - X Information Modeling: Parametric Site Analysis

Luc Wilson Thursday 5-7pm Ware Lounge

This course will examine the maturity of the 21st century metropolis by moving past conventional benchmarks and preconceptions of growth to develop flexible design systems. Founded on a holistic approach to economic, environmental, and social problems, the X-Information Modeling or XIM methodology will allow students to leverage parametric design tools to create systems that strategically integrate diverse objectives, and through Grasshopper for Rhino, visualize potential scenarios for a more informed decision making process. This is achieved through the creation of a data driven 3D modeling system focused on four primary points: integration of competing objectives, visualization of data, iteration of multiple options, and ultimately, design decision making.

In teams of 2-4, students will develop a project investigating issues of density, value, and the environment. The course long project will go through four iterative cycles, two in each session. Four corresponding assignments will introduce new topics and techniques to expand the depth of the project in each cycle. We will reverse engineer key relationships influencing design and development in order to 1) find new relationships between traditionally separate or competing objectives, 2) to visualize speculative futures, and 3) reposition and reorganize those relationships through a visualized evaluation process that challenges design and development preconceptions. Through this process students are asked to create new drawing types (static and animate) that can effectively communicate the intent of their parametric design systems for evaluation and critique. The end result will be a set of custom evaluation tools and speculative typologies.

Technically, students will learn Grasshopper for Rhino and an integrated workflow that includes Excel, Google Earth, Galapagos, Ecotect, Platypus and any Geotagged Data. Additionally, we will introduce social data from sources such as flickr and twitter into the grasshopper definitions. Conceptually, students will learn how to evaluate and use data, how to visualize metrics, and, most importantly, how to define and translate simple concepts into powerful parametric relationships. Students must know some Rhino. Grasshopper proficiency is not required, but a basic understanding will help. Grading for each session will be 30% attendance, 30% weekly assignments, and 40% for the final project.

Muchan Park and Luc Wilson developed X-Information Modeling and the content of this course

Session A - Parametric Evaluation and Speculative Housing Typologies
In session A students will focus on learning the fundamentals of the integrated XIM methodology. This will include spatial evaluation techniques, parametric massing basics, optimization, and data based decision-making. Teams will work together to create a custom evaluation system and use it to explore new housing typologies in New York City. Because teams will working on adjacent sites, the speculative typologies will impact each other necessitating the exchange of grasshopper tools and massing among teams. In the end, teams will propose a new building or block typology based on their evaluation criteria and informed by the work of the other teams. The new typologies will be deployed at the urban scale in session B.

Session A schedule
Week 1: Introduction to spatial evaluation techniques
Week 2: Basic parametric massing
Week 3: Introduction to optimization and how to combine and weight metrics
Saturday Help Session
Week 4: Review assignment 1 & optimization continued
Week 5: Platypus, animation, & clusters
Week 6: Introduction to metric visualization and dashboards & XIM system integration
Saturday Help Session
Week 7: Review assignment 2

Session A: 4839 – Open Cartographies I
Juan Saldarriaga Tuesday 5-7pm 300 Buell North

COURSE OVERVIEW
The science of cartography and its related mapping activities have undergone fundamental changes in the last decade. From being a strict scientific discipline and the domain of a few specialists, it has become an expanding, flexible, open, collaborative and participatory environment. In addition, many of the classical tenets of cartography have been swept aside and been replaced by efficient computer algorithms (for example, the projection systems in Google Maps), allowing for more speed and accessibility, and opening a set of challenges to cartographic standards. In this context, this course seeks to introduce students to the multiple existing mapping paradigms - their possibilities and their challenges -, including both the traditional rigorous methods and the new open and participatory tools.

In Session A, students will learn the basic principles of cartography and will also be exposed to the emergent set of software and online tools that are challenging those principles. Working through a set of basic mapping exercises, students will familiarize themselves with existing cartographic tools and techniques.

In Session B, students will delve deeper into a specific mapping tool and through a final project, will map and analyze urban phenomena and create a series of interactive visualizations that will address and harness new mapping technologies.

Specifically, students will learn and work with ArcGIS, MapBox and TileMill, CartoDB, qGIS and Processing and no previous coding or GIS experience is required.

TOPICS AND SOFTWARE
1 | Basic mapmaking theory and techniques
2 | Downloading, analyzing and visualizing demographic and economic data
3 | Querying social media APIs
4 | Creating and customizing interactive maps and animations
5 | Basic scripting techniques for mapping
6 | ArcGIS & qGIS
7 | CartoDB
8 | MapBox and TileMill
9 | Processing

Session B Workshops

Session B: A4525 - Simulation as the Origin of Tangible Form
Jose Sanchez Thursday 6-8pm 114 Avery

The workshop will focus on generation of visual constructs dealing with the notion of simulation and representation. We will undertake simulation as the origin of a reality, not as a representation of a formal construct, which can deal with the generation of behavioral models and abstract events without a tactile origin, hence avoiding representing an environment or event. The simulation gives origin to sequential representation of an unknown event that progressively yields to the generation of a tangible visual fabric.

In architecture, form abstraction is not always accomplished from a geometry derivative. The concept of abstraction from other disciplines can be investigated and used as a substrate for the generation of tangible form. Abstract visualization no longer precedes geometrical systems as it can be translated into geometrical structures.

We'll start by looking at Maya's Fluid Dynamics as a form/space generator, along with its traditional use of generating dynamics-based special effects for games and films. This will be followed by an in depth understanding of Mental Ray advanced rendering features, including Image Based Lighting (HDR), Global Illumination, Final Gathering, Caustics, Importons, Irradiance Particles and Ambient Occlusion. The advanced Mental Ray lecture will also cover the Mia_Material_X advanced shader, which was developed for architectural and industrial design use. Other technologies covered in this workshop are Image-Based Modeling with Maya's Paint Effects and Advanced Displacement, Advanced Particles Systems and Mathematical Expressions, Forward and Inverse Kinematics, Motion Capture and Maya's Hair System, which we will use as another alternative to generate real material behavior from a mesh. Finally, we'll learn how to use Maya's Inverse Kinematics along with Muscles, Bones and Capsule as surface control systems.

Session B: A4542 - Imagining the UltraReal
Joseph Brennan and Philip Crupi Monday 7-9pm 600 Avery

Description
The use of perspective and rendering is often an afterthought. With the abundance of 3D modeling software and the ability to see every angle of a project instantaneously, renderings are often a last minute tool for representation. This class challenges the participants to not only think of rendering as a method of presentation, but also a tool for design. We encourage the use of perspective and rendering early and often in the process. In addition to learning techniques for creating ultrarealistic renderings, we will teach a workflow that encourages early exploration. We will focus on color, light, material, context, reflection, and opacity throughout the course of the entire design. We will look for inspiration in many places, including photography and cinematography.

The class will use V-Ray for 3D Studio Max as the main engine for exploration, but will also encourage the use of other modeling applications, post processing software, and 3rd party plug-ins. No knowledge of V-Ray is required, but students should be able to model in an application of their choice (Rhino, Maya, etc.)

Each class will consist of a lecture, followed by a software demo. Other instructional video tutorials will be found online at digitalconceptsnyc.com. There will be additional required working sessions and desk crits with critics and assistants.

Session A will start to explore the basic aspects of the rendering process, including but not limited to modeling, cameras, lights, and material. Session B will expand on these ideas and delve deeper into each aspect, as well as introduce additional techniques. Students who take session B are **highly encouraged** to take session A.

Session B: A4748 - Special Topics in Fabrication: Field Fabrications
Josh Draper and Eric Hagan Tuesday 7-9pm 115 Avery

Overview
Digital Fabrication has revitalized the idea of the Architect as Maker. While new software and workflows have made digital fabrication accessible, its potential to intervene in practice is only fully realized at the level of the CNC machine. What might become possible if Architects designed and built their own machines? Agendas involving material, performance and computation could be embedded instead of inherited. New architectures could become possible when control extends to this foundational level.

Formworks is a Visual Studies Digital Fabrication course which combines casting with computational techniques through the production of a *Design Machine* - an original and specific CNC machine. Using the Firefly plug-in for Grasshopper, the Arduino microcontroller and servo devices such as stepper motors and linear actuators, students will make their own CNC machine from the ground up to produce a system of non-repetitive castings.

Formworks will be staged in two sessions over the semester. Students are strongly encouraged but not required to attend both sessions. The first session, *Design Machine,* introduces students to mechatronics techniques using Firefly, Arduino and two basic servo devices - stepper motors and linear actuators. Students will make a prototype servo device, which forms the basis of a larger system, to mechanically and computationally demonstrate a system of non-repetitive but parametrically related castings. In parallel, students will be introduced to various casting techniques. The second session, *Field Fabrications*, will iterate the prototypes, producing a larger array of robust servo devices. Full castings will be made using the system. The course will focus on pre-cast curtain walls to maximize the graphic qualities of the process.

Session B: Field Fabrications
Session B begins with a review of mechatronics techniques and Firefly operations. Using the vocabulary of servo rotations and translations, we further develop the pre-cast curtain wall design visualizing the full field pattern of a panel. Quantities, sizes and edge transitions are scoped and designed. The output of this process feeds back in to the second prototype of the *Design Machine.* We choose a manageable number of servos which, aggregated in a single device, can produce a satisfying portion of our *Field Fabrication*, our precast curtain wall panel. We then devote the necessary time to refining the *Field Fabrication*, mastering material and mechatronic processes and producing a sufficient quantity of panels to physically demonstrate the project. We end with a presentation of the synchronized Firefly/Grasshopper interface and the mechatronic *Design Machine*, a visual presentation of the pre-cast curtain wall, and the *Field Fabrication* castings.

Session B: A4808 – METATOOL II

Dan Taeyoung   Thursday 5-7pm 300 Buell North

"The user of the electric light -- or a hammer, or a language, or a book -- is the content. As such, there is a total metamorphosis of the user by the interface. It is the metamorphosis that I consider the message."

Marshall McLuhan

The architect encounters a site. Armed with an arsenal of tools, she undergoes processes of observation, research, and analysis. These operations unearth constraints and situations, which in turn define the field of possibilities in terms of space, event, and movement. Other tools allow her to sketch, improvise, represent, modify, analyze, critique, and explore this field. And over a long process of deliberation, introspection, and collaboration, she arrives at a singular decision that creates a new kind of site and a new context altogether, when set in motion.

It goes without saying that the architect's tools are her most prized possessions. They are akin to bodily prostheses: new augmentations that not only alter what can be done, but what can be represented and thus what can be conceptualized. It could even be said that the architect is indelibly influenced by the logic and agency of those tools.

This critical architect might ask: Where does the tool come from? What does the tool want to do? What new tools can be created? Should not every process of design be one that reinvents new methods of thinking, and new tools for creation? **In other words: Architects should not only be able to *use* tools, but should have the ability to *create* new critical / experimental design tools.**

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METATOOL is a course about designing experimental design tools, utilizing the Grasshopper software environment as a meta-tool: a tool that enables the creation of other tools.

The course is grounded in a solid technical understanding of Grasshopper and hovers around a set of critical history/theory texts and group discussions. Each new experimental tool will result from an examination of an existing design tool, and will be oriented towards the creation of a new design process within Grasshopper (with the optional integration of Python/C#/VB.net).

Knowledge of Rhino is assumed, and a basic knowledge of Grasshopper is recommended, but not necessary. A database of Grasshopper introduction videos, developed in conjunction with the ADR2 curriculum, will be available. A custom created Grasshopper component, Hairworm, will be used in conjunction with Github, a cloud-based platform for sharing code. The course will be the starting seed for the Grasshopper Exchange, a new online-based tool arsenal. Over the duration of the course, students will collectively amass this shared database or 'arsenal' of new Grasshopper-based tools into a suite of experimental design processes that will enable and augment new, experimental design possibilities.

Session B: A4813 – Integrated Parametric Delivery
John Lee and Brian Lee Thursday 5-7pm 202 Fayerweather

Emerging technologies in architectural design find their own time and place to be implemented. Too often the tool controls the design. When utilized effectively, advanced parametric design methodologies will facilitate numerous iterations, enabling a more resolved final product in a time restricted setting. Designers often favor one tool over another, mainly out of familiarity. This workshop will insist on interoperability between various platforms, magnifying the strengths of each tool. We will investigate the process of integrating multiple parametric tools simultaneously into a single architectural project. Specifically, we will be designing and developing workflows. Quickly becoming the industry standard for BIM, Revit will be presented as the primary tool for hosting and documenting. However, most form generation and parametric control will be driven by whichever tool students select to examine as they develop their designs and integrate them into a single process. In previous semesters, students have designed workflows between Catia, Rhino/Grasshopper, TSplines, Evolute Tools, 3DS Max, Maya, Processing, and Vasari. Within the last year, new add-ins have enabled an extensive amount of control between Revit and Grasshopper(Hummingbird, Chameleon, and OpenNURBS, for example). Most of these add-ins live in Grasshopper but have been developed to interact specifically with Revit and Vasari. We will be analyzing where such tools might best be utilized and how they could impact iterative design. Both Revit and Rhino/Grasshopper will be emphasized and demonstrated simultaneously in lectures to highlight integration potential. A basic understanding of Revit is suggested—taking ReThinking BIM (Session A) is highly recommended.

Schedule:
WEEK 01 (10/24) - Lecture // Intro to Interoperability, Project Introduction
WEEK 02 (10/31) - Lecture // Workflow Design, Rhino & Grasshopper, Project Proposal
WEEK 03 (11/07) - Lecture // Help Sessions // Adv. Adaptive Components
WEEK 04 (11/14) - Lecture // Ecotect & Galapagos, Analysis and Optimization
WEEK 05 (11/21) - Lecture // Help Sessions // 3DS Max and Revit
WEEK 06 (11/28) - Lecture // Help Sessions // Dynamo
WEEK 07 (12/05) - Help Session // Desk Crit

Session B: A4814 – Hacking the Urban Experience: Fabricating a Tactical Urbanism

John Locke Tuesday 7-9pm   600 Avery

OVERVIEW

This course seeks to assert the relevance of the fabrication skills at our disposal as potentialities for social and environmental relevance. Through the re-appropriation and re-imagining of existing urban conditions, the student will harness their entrepreneurial spirit to design and fabricate a series of fast, working prototypes that embrace the messy reality of New York. The student will begin by identifying a quality of the urban condition that includes the latent capability for improvement and work toward fabricating an adaptive, responsive and environmentally viable solution. Specific emphasis will be placed on testing and exploring through hands on research the possibilities of detailing and fabricating connections using unorthodox materials. At the conclusion of the course the student will have produced a rough proof of concept - a beta model - that synthesizes their arguments into a working intervention. Formulating a strong guiding thesis idea will be essential to the project's success, but the core challenge for the student will be converting a strong idea into physical reality, something to be observed, tested and documented.

Workshops will be conducted to introduce the students to the possibilities inherent in new material technologies, through production and detailing techniques, and the proper use of machines in the fabrication lab if necessary. Material workshops will be held to encourage students to explore with everything from dynamic, inflatable volumes to parametric agglomerations using quotidian materials.

By attempting to capture a broader audience for architectural interventions, a number of questions present themselves and the student will be challenged to anticipate possible eventualities - how will it be used? Can its use be changed? Is it durable? Is it waterproof? Can it safely stand up? Fabrication will be considered less from a formal quality, and more from a use, durability, improvisation and public participation viewpoint.

Ultimately the student will come out of the course with a healthy respect for two core concepts: Firstly, an increased skill in the use and applicability of the fabrication skills we have at our disposal for solving design issues using unorthodox materials in unconventional settings; and two, that there is an opportunity for architects to regain lost relevance by inserting themselves through unsolicited proposals into the public consciousness as steward's of urban well being.

Week 01- "HELLO" - Introductions, Overview, Introduce Assignment 01: Connection Detail

Week 02- "BIG PROJECTED SCREENS" - Discuss Assignment 01, Talk Light Projections, Tutorial on mobile power and projections

Week 03- "PROJECTION BOMBING" - We will meet as a group at the chosen sites to carry out Assignment 03 with the mobile power rig. Begin Final Project narrative.

Week 04- "BIG INFLATABLE SPACE" - Discuss Assignment 02, Talk Inflatables - History, theory, etc., Inflatable Tutorial

Week 05- "KICKSTARTING THE BROOKLYN BRIDGE" - Talk crowdfunding potentials and future trends. Final project version 1.0 due.

Week 06- "WHO OWNS PUBLIC SPACE?" - Materials Test for Final Project, Discuss corporatization and commodification of public space and the architect's role/responsibilities for design in the public realm.

Session B: A4822 – Site to Site – Site to Web
Troy Conrad Therrien and Chris Barley Thursday 7-9pm 300 Buell North

Architecture is online. Recent achievements in ubiquitous computing, machine intelligence, deep learning, ambient locative media, mobile and embedded devices, machine to machine systems and other forms of the "Internet of Things", coupled with the proliferation of cheap networked sensors and actuators has brought us to a moment in which architects no longer have the comfort of speaking of connected environments in the future tense. The technology for connecting and orchestrating physical spaces digitally are not simply accessible, they have become pedestrian. And still they have yet to fully penetrate either the architectural imaginary or the space of architecture production. This course aims to do both simultaneously.

Methdology
The course will proceed reflexively. We will investigate the necessary means for designing, representing and analyzing architecture online by producing them and using them ourselves in the process. Specifically, we will build a platform for putting architecture online, a collection of networked sentient objects and the protocols and standards that will allow them to communicate digitally with one another and spatially and organizationally with architecture. Unlike the hoards of tech behemoths and start-ups vying to become the platform for this coming wave of techno-social-spatial renewal, we will integrate the languages of technology with architecture. We will collaboratively design and implement a public application programming interface, an API, that integrates architectural representation with technical protocol.

Partnerships: Venice, Office*US*, Studio-X, Experts
We will partner with the seminar "Corporate Avant Garde" (A6453) in taking a hypothetical construct as our object: the US Pavilion in Venice as the site for a hypothetical architecture office, Office*US*. In addition to shared sessions and objectives, we will likewise consider the future of the architecture office as a multifarious space, as part-studio, part-gallery, part-event space, part-publication house, part-factory, part-school, and other parts as yet unknown. We will use Studio-X locations to test our work in a globally distributed network, allowing us to consider questions of culture, language, time, and other misalignments, and to insert our work into a live architecture discourse and practice. In parallel, we will work with a group of technology experts who are responsible for some of the major advances in the field we will enter.

Session B
In Session B, students will focus on developing applications on top of the platform, parts of which will be distributed to locations around the Studio-X global network. Students individually or in groups will first study these physical spaces and design a strategy for the deployment and installation the objects of the platform. That is, students will redesign these spaces using our platform. They will then have access to the entire network of distributed objects to design and implement applications that will affect the way in which these spaces are used, and consequently the forms of architecture production these spaces support.

The final review for the course will take the form of a staged event with invited guests. Parallel to the pedagogy of the course, the event will reflexively incorporate the objects and their applications into a discussion on the course topic with invited guests and a public audience at Studio-X NYC and perhaps simultaneously other locations.

Technology Stack
The technology stack of Raspberry Pi mini-computer powered by the Node.js application/web framework provides a favorable learning curve. The only required programming language for the course is Javascript, a front-end web programming language that Node.js allows to control intensive back-end processes. Javascript is both the most common used language in open source projects, and continues to grow for its combination of power and ease of use. In short, you've likely seen it, maybe even used it, and we are going to teach you to be a Javascript ninja by the end of the course. You will use it to control web servers, to construct a robust RESTful and streaming API, to tap into cutting edge NoSQL databases, connect to a battery of andalog and digital sensors, cameras, microphones, LEDs, servo motors, and a seemingly endless array of other input and output mechanisms.

Collaborative Infrastructure
We will also extensively employ Github in our entire process. Since its founding in 2008, Github has fueled the explosion of open source projects and online collaboration. We will use it to incorporate a lean, iterative design methodology including cloning, forking, pushing and pulling to produce a clean means of collaboration in small groups and as a large class. You will determine new ways for architects to incorporate this process into their design practice, and will likely choose to use the method for a number of other tasks going forward, as so many users have.

Session B: 4829 – X Information Modeling: Parametric Massing + Optimization

Luc Wilson Tuesday 5-7pm Ware Lounge

Session A4815 is a prerequisite for Session B

This course will examine the maturity of the 21st century metropolis by moving past conventional benchmarks and preconceptions of growth to develop flexible design systems. Founded on a holistic approach to economic, environmental, and social problems, the X-Information Modeling or XIM methodology will allow students to leverage parametric design tools to create systems that strategically integrate diverse objectives, and through Grasshopper for Rhino, visualize potential scenarios for a more informed decision making process. This is achieved through the creation of a data driven 3D modeling system focused on four primary points: integration of competing objectives, visualization of data, iteration of multiple options, and ultimately, design decision making.

In teams of 2-4, students will develop a project investigating issues of density, value, and the environment. The course long project will go through four iterative cycles, two in each session. Four corresponding assignments will introduce new topics and techniques to expand the depth of the project in each cycle. We will reverse engineer key relationships influencing design and development in order to 1) find new relationships between traditionally separate or competing objectives, 2) to visualize speculative futures, and 3) reposition and reorganize those relationships through a visualized evaluation process that challenges design and development preconceptions. Through this process students are asked to create new drawing types (static and animate) that can effectively communicate the intent of their parametric design systems for evaluation and critique. The end result will be a set of custom evaluation tools and speculative typologies.

Technically, students will learn Grasshopper for Rhino and an integrated workflow that includes Excel, Google Earth, Galapagos, Ecotect, Platypus and any Geotagged Data. Additionally, we will introduce social data from sources such as flickr and twitter into the grasshopper definitions. Conceptually, students will learn how to evaluate and use data, how to visualize metrics, and, most importantly, how to define and translate simple concepts into powerful parametric relationships. Students must know some Rhino. Grasshopper proficiency is not required, but a basic understanding will help. Grading for each session will be 30% attendance, 30% weekly assignments, and 40% for the final project.

Muchan Park and Luc Wilson developed X-Information Modeling and the content of this course

Session B - Urban Analysis and Application of Speculative Housing Typologies
Session B will advance the topics of session A (evaluation techniques, parametric massing and optimization) and introduce grasshopper techniques focused at the urban scale. Through streaming in geotagged data sets, including GIS, PLUTO, 311, Twitter, and Flickr, students will develop urban filtering criteria to identify sites across New York City appropriate for the speculative building or block typologies designed in session A. Teams will work simultaneously at the urban scale to choose sites and deploy their typologies and at the building scale, refining their typology based on the various urban conditions encountered. In the end teams will propose urban filtering criteria focused around housing issues, new typologies, and an urban scale application of the proposed typology.

Session B Schedule:
Week 8: Streaming GIS and other external data sources
Week 9: Advanced Parametric Massing Techniques
Saturday Help Session
Week 10: Review assignment 3
Week 11: Advanced Visualization Techniques
Week 12: Performative Detailing
Week 13: Individual project desk crits
Week 14: Final Review (assignment 4)

Session B: A4836 – Datamining the City II: Culture, Urbanism, and Web 2.0

Danil Nagy Thursday 3-5pm 300 Buell North

- *What can we learn about the city given the massive amounts of data present on the internet?*
- *How do we utilize new software tools to extract, gather, and process this data?*
- *What new sources of data can we uncover and what will this tell us about our cities?*

Description:

This seminar will focus on developing strategies for datamining large datasets from the web and processing them spatially to derive new knowledge about the city. Lectures will provide students with a theoretical and historical basis for this kind of research, as well as training in the specific tools that will be used. The class will take a hands-on workshop approach to teach practical skills in basic programming, web scraping, big data, GIS, and visualization. The main tools will be *Python* and *QGIS*.

The context of the research will be the Pearl River Delta in China, the world's largest megalopolis containing at least 60 million people. The research will focus on urban issues that have been difficult to research using traditional data and tools, including migration, informal housing, and grey market economies.

Students will be provided with an initial set of data, but will be expected to gather and process additional data sources to supplement their thesis. The class will be divided into groups to produce 4-6 projects, with each group expected to fulfill the following requirements:

- Generate a proposal or <u>hypothesis</u> for research based in the Pearl River Delta
- Create custom scripts to collect, organize, and <u>process</u> this data
- Spatially analyze this data to create a <u>model</u> within a GIS
- Create provocative visualizations that <u>demonstrate</u> some conclusion about the chosen issue.

Schedule
Session B – Modeling, Machine Learning, and Advanced Visualization

Week 7 Graph theory for urban network analysis
Week 8 Introduction to machine learning, classification and regression
Week 9 Unsupervised learning, clustering and trees
Week 10 Interactive visualization in Tilemill and Mapbox
Week 11 Advanced visualization, animation, and d3
Week 12 Final Review, presentations

* since the class will be based around a group research project, students are highly encouraged to register for both sessions A and B

Session B: 4843 – Open Cartographies II
Juan Saldarriaga Tuesday 5-7pm 300 Buell North

COURSE OVERVIEW
The science of cartography and its related mapping activities have undergone fundamental changes in the last decade. From being a strict scientific discipline and the domain of a few specialists, it has become an expanding, flexible, open, collaborative and participatory environment. In addition, many of the classical tenets of cartography have been swept aside and been replaced by efficient computer algorithms (for example, the projection systems in Google Maps), allowing for more speed and accessibility, and opening a set of challenges to cartographic standards. In this context, this course seeks to introduce students to the multiple existing mapping paradigms - their possibilities and their challenges -, including both the traditional rigorous methods and the new open and participatory tools.

In Session A, students will learn the basic principles of cartography and will also be exposed to the emergent set of software and online tools that are challenging those principles. Working through a set of basic mapping exercises, students will familiarize themselves with existing cartographic tools and techniques.

In Session B, students will delve deeper into a specific mapping tool and through a final project, will map and analyze urban phenomena and create a series of interactive visualizations that will address and harness new mapping technologies.

Specifically, students will learn and work with ArcGIS, MapBox and TileMill, CartoDB, qGIS and Processing and no previous coding or GIS experience is required.

TOPICS AND SOFTWARE
1 | Basic mapmaking theory and techniques
2 | Downloading, analyzing and visualizing demographic and economic data
3 | Querying social media APIs
4 | Creating and customizing interactive maps and animations
5 | Basic scripting techniques for mapping
6 | ArcGIS & qGIS
7 | CartoDB
8 | MapBox and TileMill
9 | Processing