A4778:
Metatool: Thoughtful Environments

Instructor: Dan Taeyoung
Tuesday 5-7pm

PREAMBLE

We are aliens from another solar system, observing a group of architects.

These architects seem to be thinking about a location in space that they call a *site*. Armed with an arsenal of tools, they visit the location, talk to people, take photographs, sketch, model, look at the computer. They look at pieces of paper on tablets and walls, point at computer screens, hold physical objects. When they spend time on their screens, they manipulate maps, models, diagrams, spreadsheets, images, photographs, photorealistic renderings.

They also talk to each other a great deal.

It seems that what these architects are trying to create or change is a complex system, a field of possibilities in terms of space, event, and movement.

To us aliens, the architects' tools seem 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. The architects seem indelibly influenced by the logic and agency of those tools — what they create seems to be influenced by what they use to create.

Let us ask: Where do their tools come from? What do they want to do with the tool, and what does the tool want them to do? How do their tools change how they think? What new tools could they create?

DESCRIPTION,

or how we will play

The core thesis of Metatool is: to design critically, intentionally, intelligently, and playfully, **designers must have the ability to design new critical / experimental / playful design tools.**

Metatool is a critical + technological course. This means:

Technological: Metatool is a prototyping & experimentation course. We will use Grasshopper as a metatool: a tool that enables the forging of other tools. With Grasshopper (and other tools), we will prototype experimental design tools and discuss how they change our design

process. In the second half of the semester, we will create tangible user interfaces, bringing Grasshopper outside of the screen and onto the table.
Critical: We will often have theory or philosophy readings that touch on the nature of tools through a pedagogy/cognitive science/philosophy lens. Texts we will discuss include essays by Bret Victor, Bruno Latour, Donna Haraway, Seymour Papert, Alva Noe, and Marshall McLuhan. See the bibliography for further references.

PREREQUISITES / STRUCTURE

The class is designed to work with people at multiple levels of familiarity with Grasshopper and computation. If you are new to Grasshopper, you are very welcome! If you are familiar with Grasshopper and interested in other programming/computation knowledge (Python, C#, Processing, Node, etc), you are also very welcome.

The course is structured along the lines of the 'flipped classroom': in which lectures, workshops, discussions, and peer critiques happen during class. Outside of class, video tutorials for Metatool will be made available, as well as the Skill Tree, an archive of general Grasshopper videos, developed in conjunction with the ADR curriculum.

SCHEDULE

First half of semester: Thinking Tools

In the first half of the semester, Grasshopper will be used to create tools in Rhino that construct playful spaces for computational design: new interfaces, ways of working with data and representation. To use a playground metaphor, we will be creating the sandboxes, shovels, and sand -- environments in which designers can interact and play. How do you affect your architectural design process by shaping your environment? How do you balance intent with play, data with inspiration?

The first half is oriented around learning Grasshopper and using it as an environment to create new tools. We will create two experimental tools that are aimed at altering our own design processes, balancing a deep understanding on Grasshopper and computation, with the conceptual question of how computation incorporates itself into your design.

We will focus on especially on tools that change the way you think!

Second half of semester: Thoughtful Environments

In the second half of the semester, we will treat our spaces as extended environments for creating tools. In the first half, we have used Rhino as the environment inside of which we develop a tool. In the second half, we will understand that the computer and the physical environment around it -- the table, chair, room -- is also part of the design context.

Using spatial devices such as projectors, iphones, cameras, keyboards, barcode scanners, we will create an environment, outside of the screen, onto the table.

Inspired by Dynamicland and the Tangible Media Group at MIT Media Lab, our tools will be about thinking collectively and spatially. We will experiment and prototype ways to understand, share, and design.

The goal is to experiment with creating environments to craft the way we work. How do environments already affect the way we think? How do we already distribute ways of thinking into our context? Can we craft different environments to change how we think? Until the end of the semester, the environment will be considered a spatial medium for thought. Using our projection-driven table, we will prototype and experiment with environments that changes the way we design and work with each other.

Every week in class, we will:

- **Discuss a short reading**
- **View each other's' work**
- **Engage in an in-class workshop, crit, or discussion**

During the week, on your own time, you will:

- **Work on tutorials / exercises / assignments**

I will hold office hours on a weekly basis.

Sep 3	No class - V/S presentations
Sep 10	**Really Noticing Tools** What really are tools? What makes something a tool? How does a tool shape our thoughts, desires, possibility spaces, and joys? Tutorials for next week Intro to Grasshopper tutorial

	Grasshopper Challenges (2-3 hours) -- **Input:** Geometry Pipeline, Geo input, Text input, Sliders, Points **Process:** Circles, Polylines, Extrusions, Flounder Camera, **Output:** Custom Preview, Custom Preview Filter **Examples:** TreePlacer, ColumnPlacer
Sep 17 -	**Tools that calculate, tools that push back** Some tools do your bidding, and calculate answers. Other tools hold your agency and prevent you / tell you to do certain things. How can we use logic/algorithms to do both? **Logic:** Greater than, Dispatch, Stream Filter, etc **Representation:** Gradient, Color, etc **Output:** Custom Preview, Custom Preview Filter
Sep 24	**Tools that see relationships** So far, we have used tools that structure our individual interactions. Can we start to create and invent tools that are about *relationships* - relationships with things already in our site, or between the things be put down? How do we use data manipulation and trees to shape our relationships?
Oct 1	**Other Inputs, other outputs** What kind of inputs are we using? Can we experiment with data sources from the internet, the camera, mouse input, keyboard input? How can we shape our inputs and outputs to think of new forms of tools? **Software:** Camera, keyboard, mouse movement, sound, Leap Motion, webcam, Kinect, OSC, and other inputs into Grasshopper **Reading for this class**: How bodies matter: five themes for interaction design

Oct 8	**Affordances and Interfaces** We are always using and creating interfaces. Creating new interfaces are not just about making things 'easier', but about shaping the ways in which we see a tool. Can we create interfaces that shape our tools for the user? What about cleaning our code so that other people can fix and alter our code, in turn?
Oct 15	**Midterm review**
Oct 22	**Thoughtful Environments** How do we think through our environments? How are environments extensions of our mind? What tools and contexts can we experiment with, outside of the computer, that shapes the way we design inside of the computer? And how does being in a shared environment mean that we exist in a shared mind? **Software:** OpenCV line -> Rhino, Computer vision tools QR code input / barcode input Sketching / drawing paper workflows
Oct 29	**Collaborative processes** Social relations change the way we design. Can we invent a new social relations? How would you use your computer if two people used it at the same time? Or if you handed off control of your computer to each other? **Software:** Rhino Aliases, Speckle Streams, Networking & APIs, OSC / Websocket
Nov 5	**No class** - Election Day Holiday
Nov 12	**Feedback loops** Design and collaboration processes are not linear; they exist as continuous loops of output and input. How does your work inside of the computer exit the computer? How does it, then, re-enter the computer?
Nov 19	**Seeing Spaces & Dynamicland** What are some examples of advanced collaboration and design practices that currently exist in the world?

	Software: Paperhopper / TUIO / RFID scanners / Optical sensors
Nov 26	**Final Project feedback session**
Dec 17 (Exact date TBD)	**Final Review**

CODE OF CONDUCT / INTENTION

Every social environment, including a university or a class setting, has a culture and a series of social norms, whether created consciously or unconsciously. As the instructor, one of my goals is to set the boundaries and tone of the class, and to actively create a space that is supportive, safe, respectful, experimental and playful.

I strongly believe in a culture of experimentation, play and risk-taking. This kind of true learning best flourishes in a supportive, safe environment. In the class, we will prioritize learning over performance, and experimentation over success.

Together, Metatool is a space where we can be:
• absolutely free of any form of harassment
• respectful, positive, and thoughtful
• supportive and generous of each others' work
• actively listening, and giving space to others to speak
• crediting each other for their work
• comfortable with silence
• grateful about valuable mistakes
• excited about risky ideas.

I am always available to talk and to provide help, and take your thoughts seriously. I can best be reached at: dan.taeyoung@columbia.edu.

GRADING

Grades

All courses that are part of Columbia GSAPP's curriculum have HP/P/LP grades.

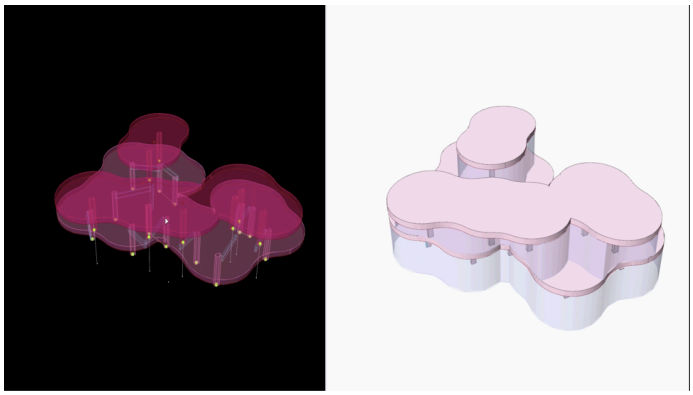
In my belief, at their best, grades offer a mildly helpful metric to each student for how much change and progress they have achieved in a semester. At their worst, grades help generate a risk-averse system where exploration and curiosity are left unrewarded or punished.

As a result, in Metatool, I place a strong focus on taking risks and being curious (relative to each student), in addition to project depth and class participation. A risky project through which we learn is more valuable than a perfectly-executed project that is very familiar to the student.

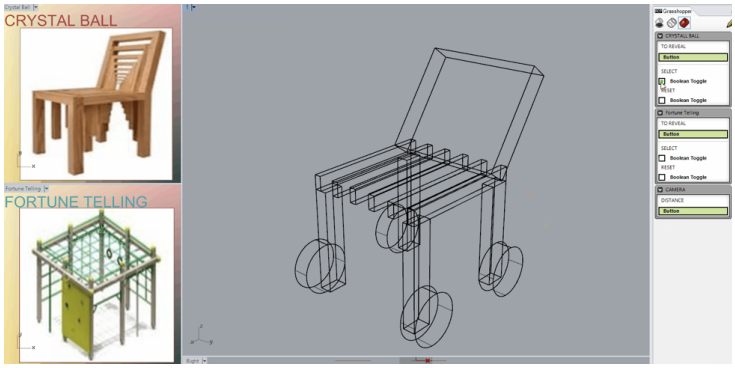
In the interest of transparency: grading is done by these four factors:

1) class listening & participation 2) project execution 3) amount of learning growth 4) amount of risk taken. Each of those factors are equally weighted to each other. I try my best to grade projects based on each student's personal direction, and not calibrated to my own taste. The factors are designed so that the way to get an 'ideal grade' is simply to be share and listen, be curious, and learn from working on a project that you find fascinating and interesting.

EXAMPLES / PAST WORK

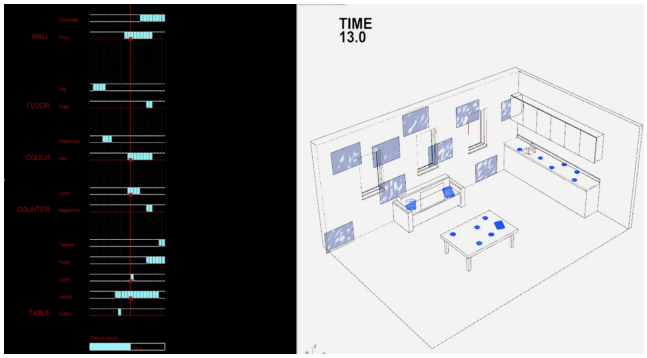


Jasmine Ho: A tool that helps you design a building by placing columns

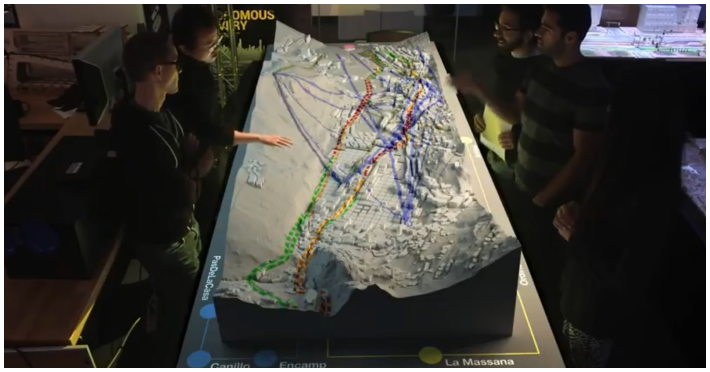


Yang Qi: A tool that attempts to inspire you by showing you relevant imagery

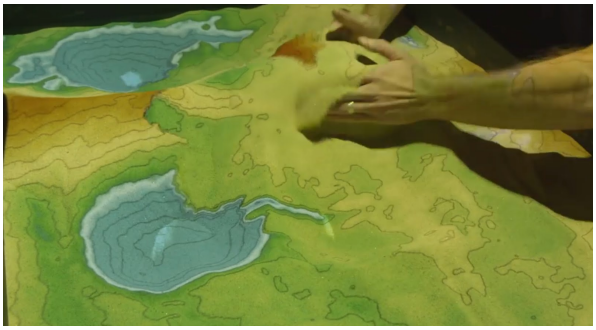
Shuo Yang: A tool that deletes your work when you are upset



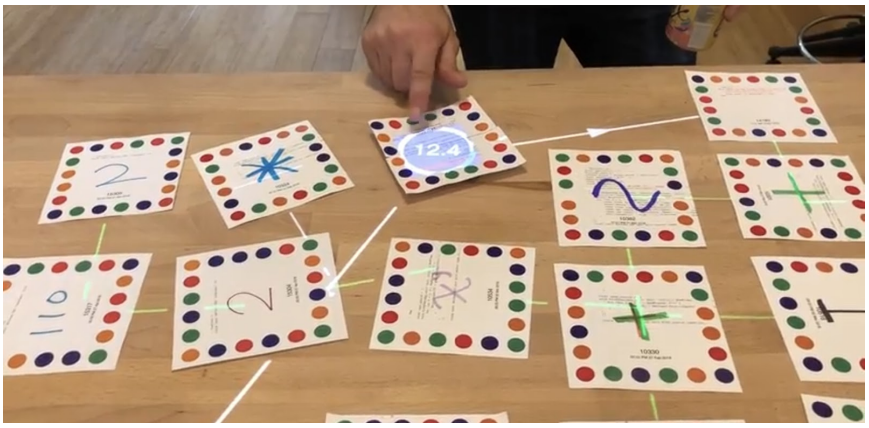
Valerie Lechene, Jasmine Ho: a tool that designs temporal activity, not space



MIT Media Lab City Science Lab, CityScope: Andorra



Augmented Reality Sandbox, UCLA



Dynamicland, Bret Victor

BIBLIOGRAPHY

This is a partial list of texts that are relevant to Metatool.

- Bruno Latour, "A Cautious Prometheus? A Few Steps Toward a Philosophy of Design"
- James Gibson, "The Theory of Affordances" from The Ecological Approach to Visual Perception
- Langdon Winner, Do Artifacts have Politics?
- Sara Hendren All Technology is Assistive
- Daniel Davis, "A History of Parametric"
- Ian Bogost, *Alien Phenomenology, or What It's Like to Be a Thing*
- Donna Haraway, "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century"
- Ivan Illich, *Tools for Conviviality*
- Marshall McLuhan, *The Medium is the Message*

- Alva Noe, *Action in Perception*
- Abigail J. Sellen and Richard H. R. Harper, *The Myth of the Paperless Office.*
- Seymour Papert, *Mindstorms: Children, Computers, and Powerful Ideas*
- Gordon Pask, “The Architectural Relevance of Cybernetics”
- George Polya, *How To Solve It*
- Bret Victor, “Seeing Spaces”
- Alejandro Zaero-Polo, *The Politics of the Envelope*