

Finding Context



Finding Context

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Architectural Research

What constitutes architectural research?

“We guess our research falls into two areas: *what is life today*— and here we mean art, music, media and other contemporary media activities— and *what techniques* we can discover or invent to bring architecture to life— here we mean what science, what technology, what invention enables us to realize our architectural vision, to cohabit and merge artificial and natural processes in our daily life.”

— Jacques Herzog in conversation with Jeffrey Kipnis, “A Conversation,” in: *El croquis*, Herzog & de Meuron 1981-2000, 60+84, 2000, pp. 27-37, excerpts

Abstract

This thesis seeks to explore and project alternative mediums to an end product with new techniques, technology, and tools that are altering current modes and methods within the design process. Digital technology does not replace any existing design methodology, strategy, or technique. The introduction of new ideas develops new approaches in combination with the traditional ways of working. Contemporary media and speculative technologies in combination with architectural process also influence research and production within design. Designers have new tools stemming from digital roots and developing into a hybrid process. The natural and synthetic approaches develop new typologies that can be built further upon. An exhibition, *Sturm der Ruhe*, presented by Architekturzentrum Wien, asks the simple question of what is architecture? All answers are pertinent and could be considered the methods of development; there are multiple ways of working. *Finding Context* explores speculative mediums to an end product.

SPACE OF LANGUAGE | CASING FOR PICTURES | IMPRESSION | FEELING |
PHYSICAL PRESENCE | EUPHORIA | CULTURAL VALUES | SOCIAL RELATIONS |
CONVENTION OF NORMS | IMAGES | MEMORIES | SPATIAL AND TEMPORAL FORM
OF SENSATION | DIALECTICAL EXPERIENCE OF DISTANCE AND CLOSENESS |
MOMENT OF DESIRE | ABSENCE | SUBJECTIVE FACTS | AMBIENT QUALITIES |
LIGHTNESS | HEAVINESS | STAGING OF EVERYDAY LIFE | THEATRICAL EFFECT |
EPHEMERAL CHARACTER OF A PLACE | SITUATIONS | ZEITGEIST | EMBODIED
OBJECTIVITY | SITUATED KNOWLEDGE | WAYS OF LIFE | PRACTICES OF
VISUALIZATION | CONFUSION OF VOICE AND SIGHT | SENSIBILITY | SCIENCE |
TECHNOLOGY | VIEWPOINTS | CONTEXT | DIRECT EXPERIENCE | ATTENTION |
DISTRACTION | MODELS OF RECEPTION | NARRATIVE | INSTITUTIONAL PROGRAM |
TRANSPARENCY | REPETITION | COUNTER-MEMORY | CRITICAL STRATEGY |
IDEOLOGY | IDEAS | SHAPE | DETAIL | REAL WORLD | POETIC QUALITY OF
MATERIALS | DESIGN | IDEALIZED VIEW | LANGUAGE OF THE NEIGHBORHOOD
SOCIAL DOMAIN | CULTURAL SUBTEXTS | CODES | ACTS | FUNCTIONAL
PREREQUISITS | POLITICS OF TASTE | MASS MARKETING | PERFECTION | HIGH
CULTURE | SEAMLESSNESS | PURITY | CONDITIONS OF BUILDING | RESEARCH |
ARCHITECTURAL LAWS | LAWS OF TECHNOLOGY | NORMAL LIVES | REALITY |
FICTION | IMMEDIACY | SEAMING | SUBJECTIVISM | INTENTION-EXPRESSION |
MODEL OF CONSCIOUSNESS | GESTALT-FORMATIONS | EXPERIENCED SHAPE |
DEDUCTIVE STRUCTURE | ARCHITECTURAL MEANING | PRESEMIOTIC
EXPERIENCE | CORROSION OF THE SYMBOLS | PERCEPTION OF CORPORAL
REALITY | RECONSIDERATION OF THE ACT OF SEEING | FORMING OF THE FIVE
SENSES | DEALING WITH THINGS | THE VISIBLE | THE TOUCHING AND THE
TANGIBLE | VISION | THE SENSIBLE SENTIENT | BOND BETWEEN THE FLESH AND
THE IDEA | ORGAN OF EXPERIENCE | INTERMODAL QUALITIES | PHENOMENA OF
HUMAN SENSUALITY | INTUITION | REFLECTION | ECONOMY OF THE BODY |
EMOTIONAL | FIELD OF ACTION | TOOLS OF PERCEPTION | MILIEU FOR YOUR
EMBODIMENT | INVISIBILITY | MATERIAL PRACTICES OF MANAGING BODIES IN
SPACE | BUILDING-BODY-ECOLOGY | SKIN | ELSEWHERE'S | FREQUENTED PLACE |
INVASION OF SPACE BY TEXT | SPACE CONSUMERS | MATERIAL REALITIES |
IMMATERIAL PROCESSES

ARCHITEKTURZENTRUM WIEN (ED.)
VERLAG ANTON PUSTET

STURM DER RUHE

WHAT IS ARCHITECTURE?

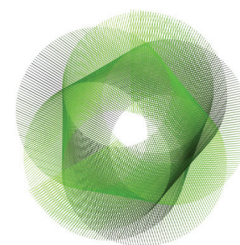
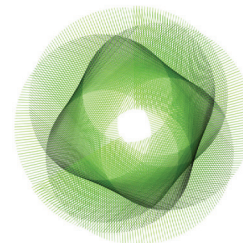
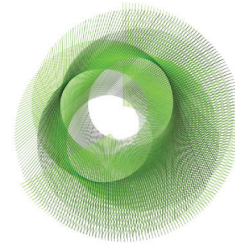
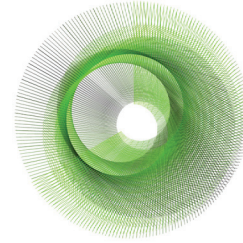
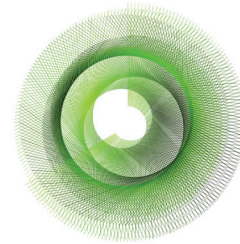
Generative Software

The result of using a digitized process is faster and results higher quality product when used in the correct manner. Wim Crowell, graphic designer of Total Identity, explains,

“I would have liked to have, in the 60’s, the computer because we can speed up our work, and we can do it so much better especially all the layers you can bring into the work. We had the greatest problem in the 60’s to bring two or three layers into the work. You needed to do it by photograph or other crazy techniques — and working on a poster took us days. Now within a half hour you have your ideas and you can make variations and make a good choice. You can’t do better design with a computer, but you can speed up your work, enormously.”

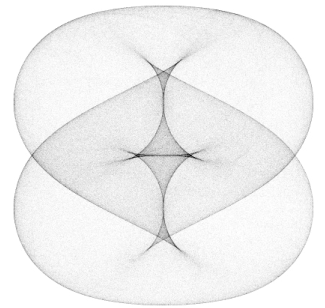
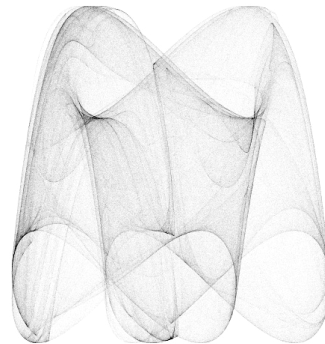
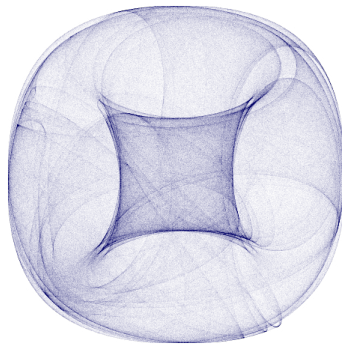
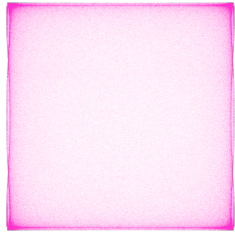
In 2010 the digital transition is currently creating questions within many fields. Compared to the digital transition of analog television signals to digital technology, it opens up the spectrum of frequencies where new technologies can be developed. Generative software is one field where it could be considered a contrast methodology when working on architectural development. Using computation can produce aspects of the unexpected resulting in new ideas.

Investigating software as a tool for an architectural process and its possible derivatives raises the question of what is the role of generative software? Can a simple attractor become a built structure? The program simple attractor uses attractor equations to generate the visual representation of the equation. Can this become an architectural process? Does a digital process inherently create out of context solutions? What are the roles of these digital tools?



Simple Attractor

<http://www.subblue.com/blog/2008/5/26/simple-attractors>



These images are generated by two attractor equations credited to Peter de Jong and Cliff Pickover.

Peter de Jong:

$$x' = \sin(a * y) - \cos(b * x)$$

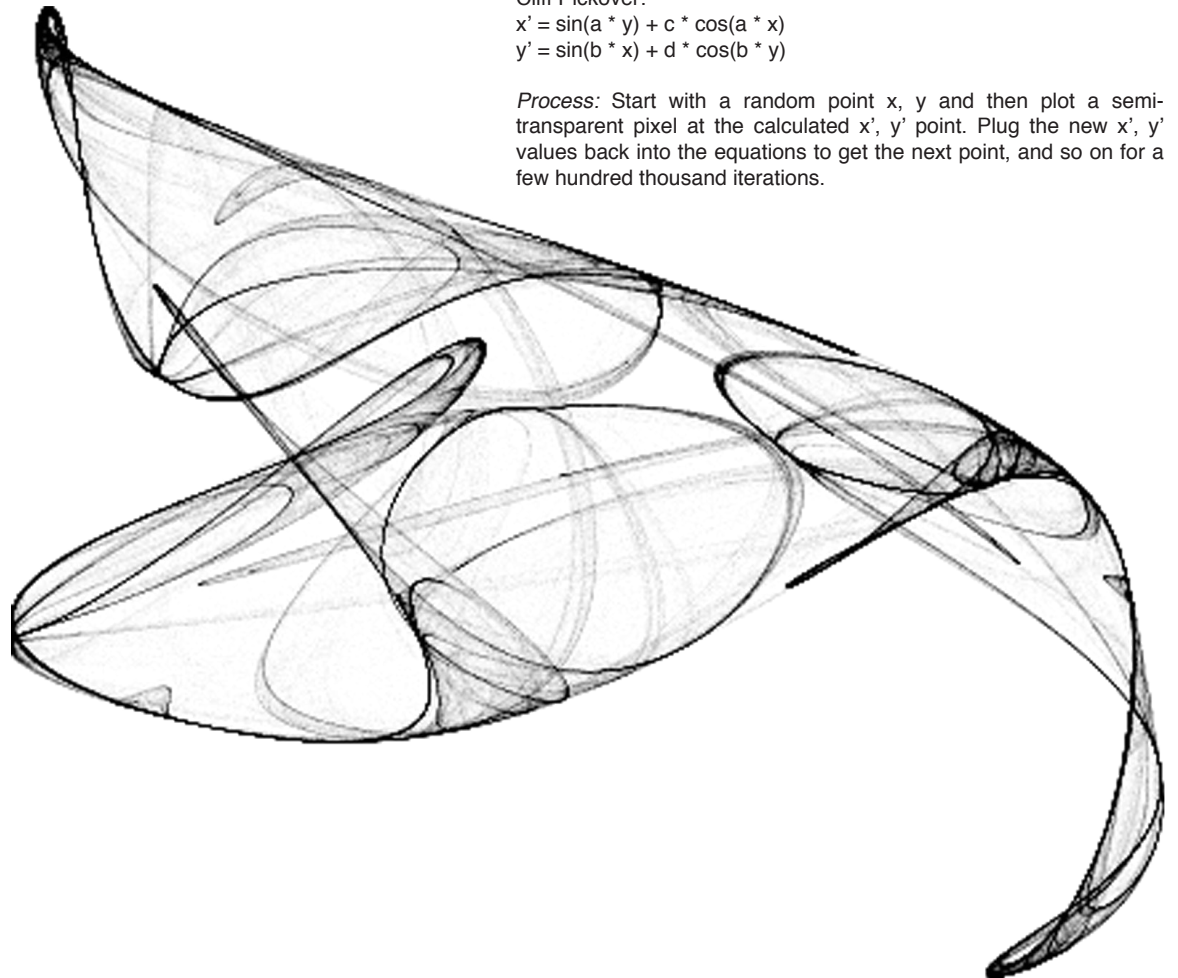
$$y' = \sin(c * x) - \cos(d * y)$$

Cliff Pickover:

$$x' = \sin(a * y) + c * \cos(a * x)$$

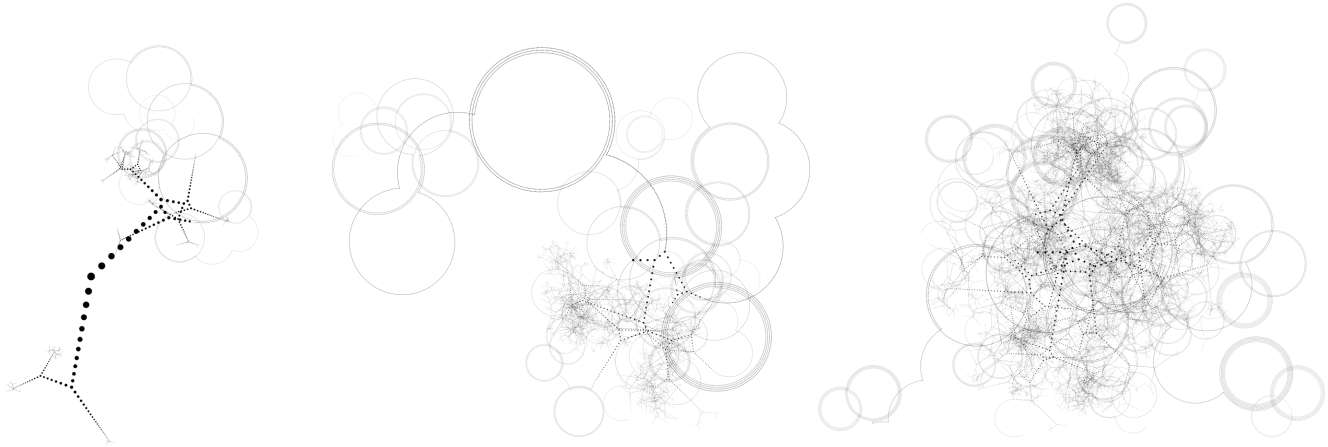
$$y' = \sin(b * x) + d * \cos(b * y)$$

Process: Start with a random point x, y and then plot a semi-transparent pixel at the calculated x', y' point. Plug the new x', y' values back into the equations to get the next point, and so on for a few hundred thousand iterations.



Context Free

<http://www.contextfreeart.org/>



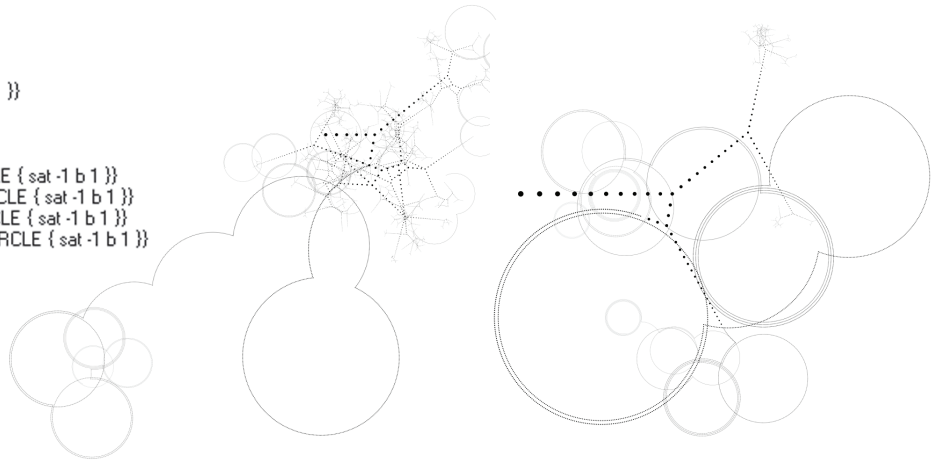
These images are generated from written instructions called grammar. The program follows the instructions in a few seconds to create images that can contain millions of shapes.

Grammar:

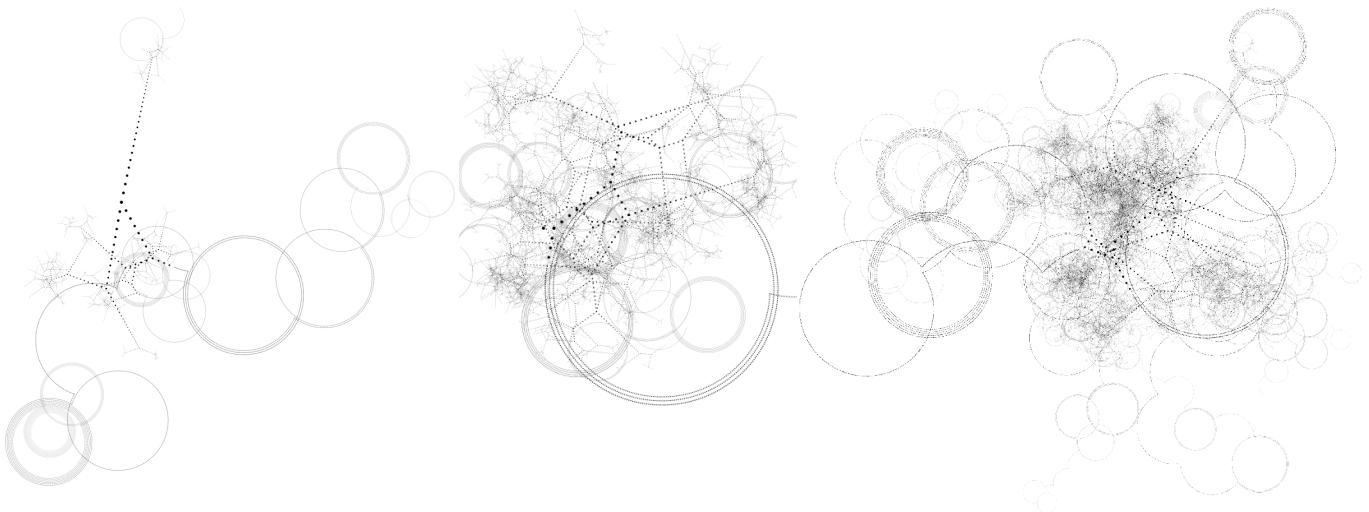
```
startshape B  
background { b -1 }
```

```
rule B { CIRCLE {} B { x 3.5 s .95 } CIRCLE { sat -1 b 1 } }  
rule B .1 { B { r -100 } B { r 39 } CIRCLE { sat -1 b 1 } }  
rule B .01 { A { s .4 } CIRCLE { sat -1 b 1 } }
```

```
rule A { CIRCLE {} A { x 2 r 1 s .9999 b .0001 } CIRCLE { sat -1 b 1 } }  
rule A .002 { CIRCLE {} A2 { r -100 s .9 b .0001 } CIRCLE { sat -1 b 1 } }  
rule A2 { CIRCLE {} A { x 2 r -1 s .9999 b .0001 } CIRCLE { sat -1 b 1 } }  
rule A2 .002 { CIRCLE {} A { r 90 s .9999 b .0001 } CIRCLE { sat -1 b 1 } }
```

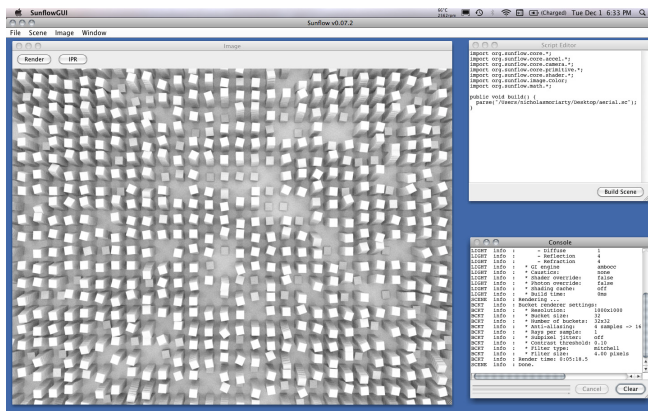
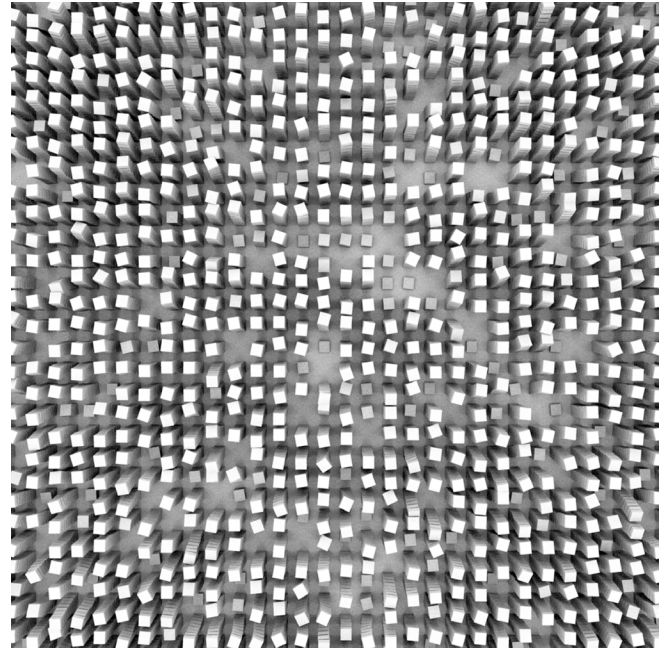
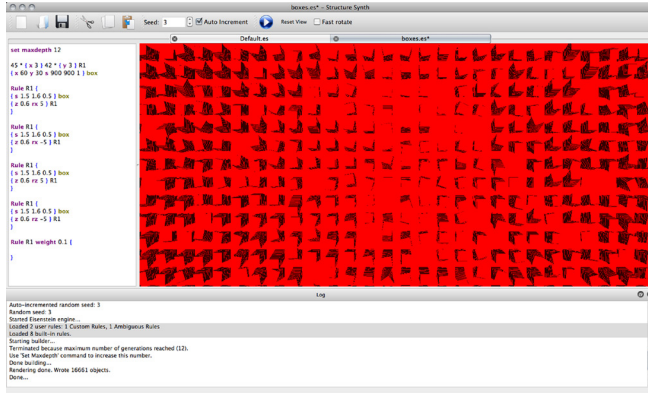


Critique: Ironically the program is called Context Free. The images the code produces are infinite. How can these current generative design strategies find context when designing in a vacuum?



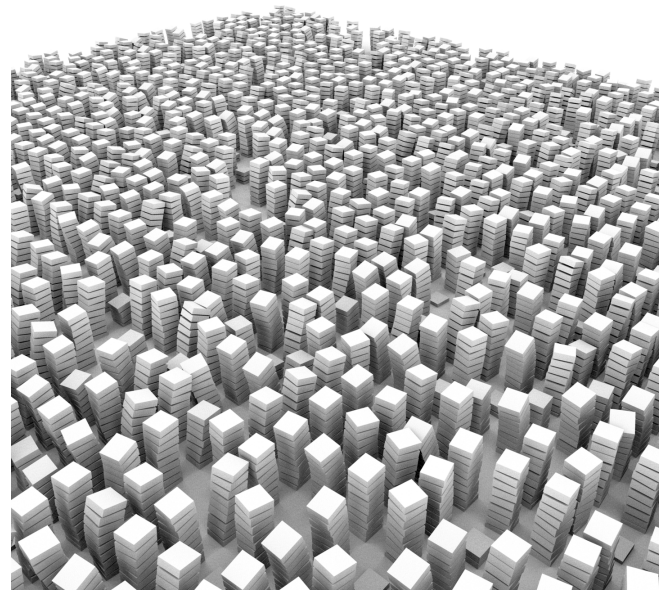
Structures Synth

<http://structuresynth.sourceforge.net/>



Structure Synth is a cross-platform application for generating 3D structures by specifying a design grammar. Even simple systems may generate surprising and complex structures. The design grammar approach was originally devised by Chris Coyne.

Structure Synth offers a graphical environment with multiple tabs, syntax highlighting, and OpenGL preview. Integration with third-party renderers (such as Sunflow and POV-Ray) is possible using a flexible template based export system. Structure Synth is built in C++, OpenGL, and Qt 4.5. Builds are currently provided for Windows and Mac.



Processing

<http://processing.org>

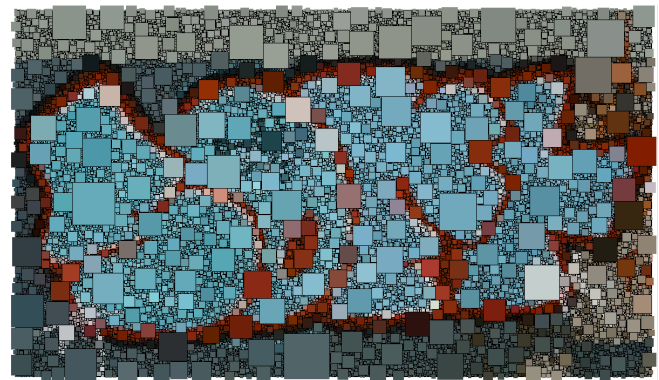


Processing is an open source programming language and environment for people who want to program images, animation, and interactions. It is used by students, artists, designers, researchers, and hobbyists for learning, prototyping, and production. It is created to teach fundamentals of computer programming within a visual context and to serve as a software sketchbook and professional production tool. It can be downloaded from external processing.org.

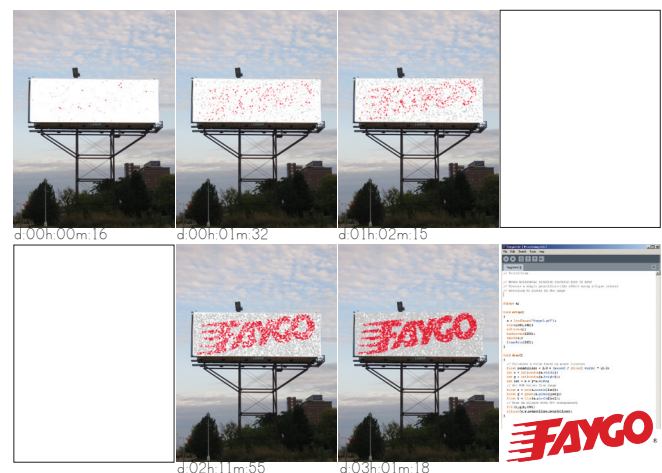
It was developed in the incubator of the MIT Media Lab with an open source attitude that produces content that is naturally shared over the internet. Many fields are currently using processing because its platform is easier to use than others. There are now classes in architecture curriculums attempting to blend this platform and architectural experimentation. The results from some of these studios produces many interesting interactive visuals but are hard to develop to an architecture. These scripts create a visual representation of the designers narrative and are not developed in a vacuum, these ideas are usually first sketched out. When talking about digital mediums the only successful projects start for analog foundations. The most successful representation of how such processing visuals are not from architecture students, because of the short amount of time to learn the program. The best examples come from computer scientists that are interested in art and design in general. An example of this would be Supershapes 3D, this application creates shapes with 3D depth adjusted by interactive slider tabs to manipulate the shapes, creating almost an infinite about of combinations.



Graffiti Image: 2D graphics research with processing platform to develop an understanding of visual scripting



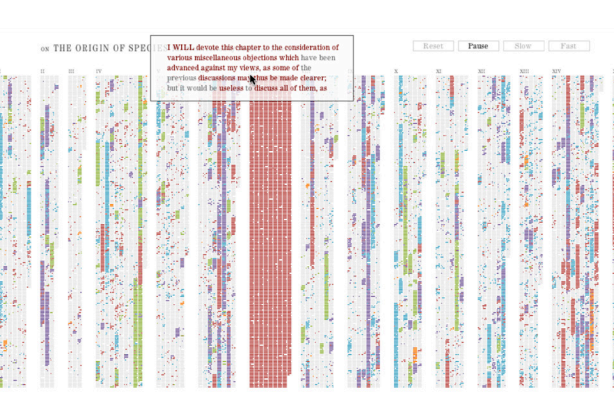
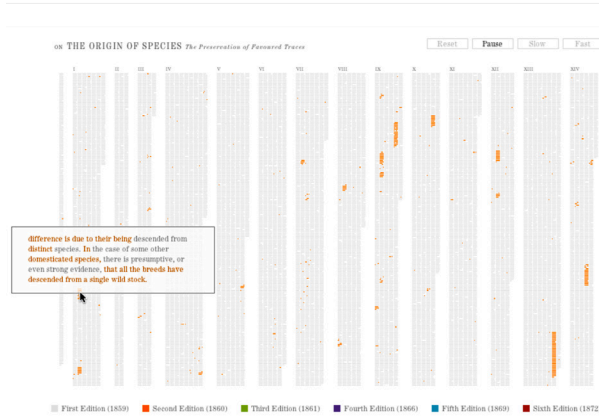
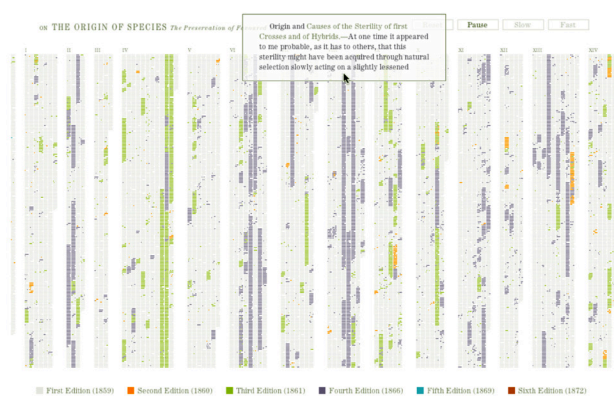
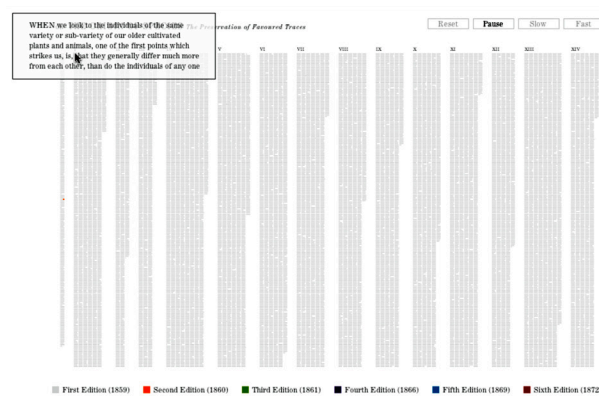
Graphic design proposal using processing platform that generates an image over a period of time using LED billboard as the projection technology. The script takes a source image and generates an abstracted outcome. In this circumstance the scripts concept is a growth with a magnified round pixel. The goal is that the steady progression of the image would intrigue viewers.



Origin of Species

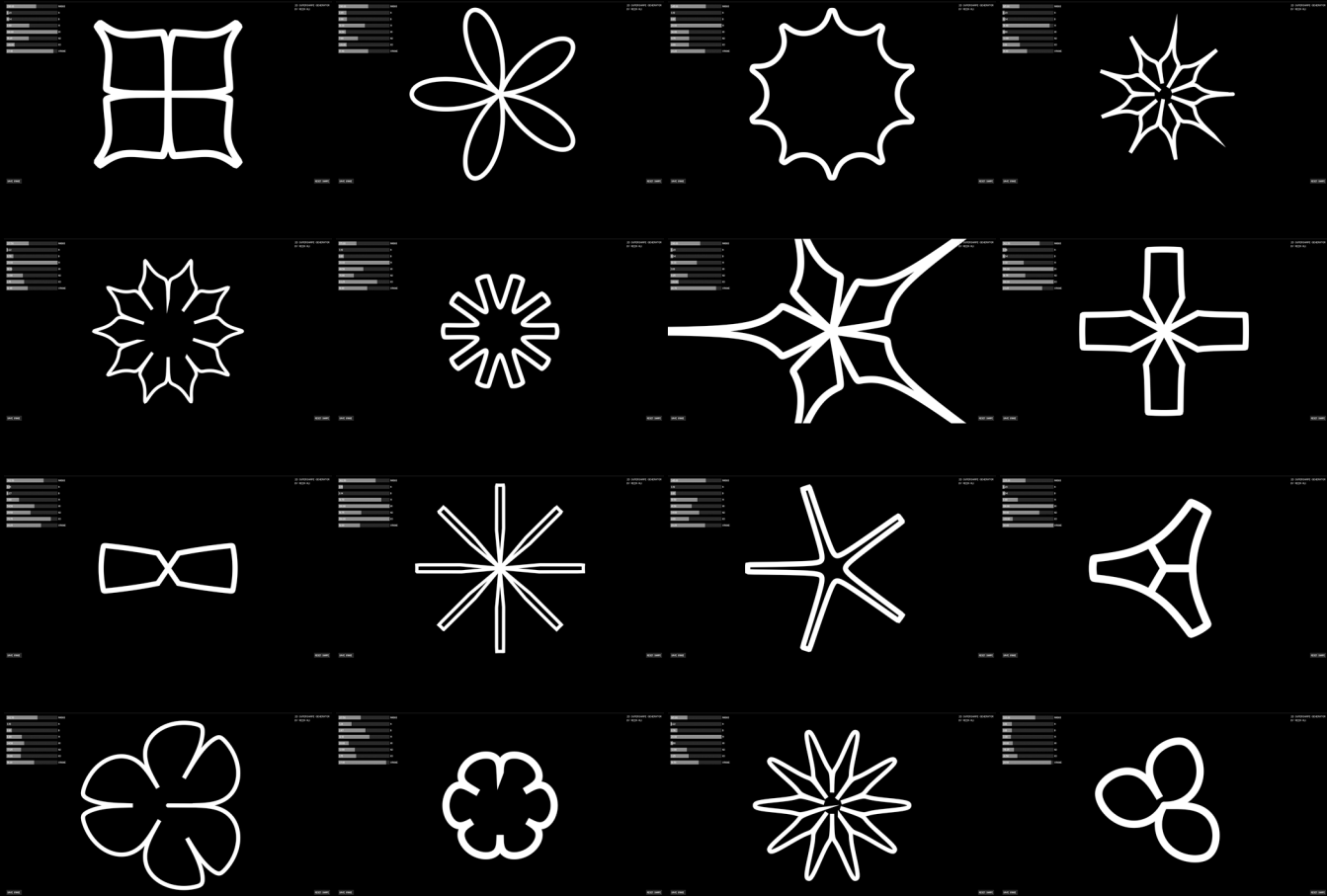
<http://benfry.com/traces/>

We often think of scientific ideas, such as Darwin's theory of evolution, as fixed notions that are accepted as finished. In fact, Darwin's *On the Origin of Species* evolved over the course of several editions he wrote, edited, and updated during his lifetime. The first English edition was approximately 150,000 words and the sixth is a much larger 190,000 words. In the changes are refinements and shifts in ideas — whether increasing the weight of a statement, adding details, or even a change in the idea itself. This is an example of the possibilities of visualizing information with real time interaction.

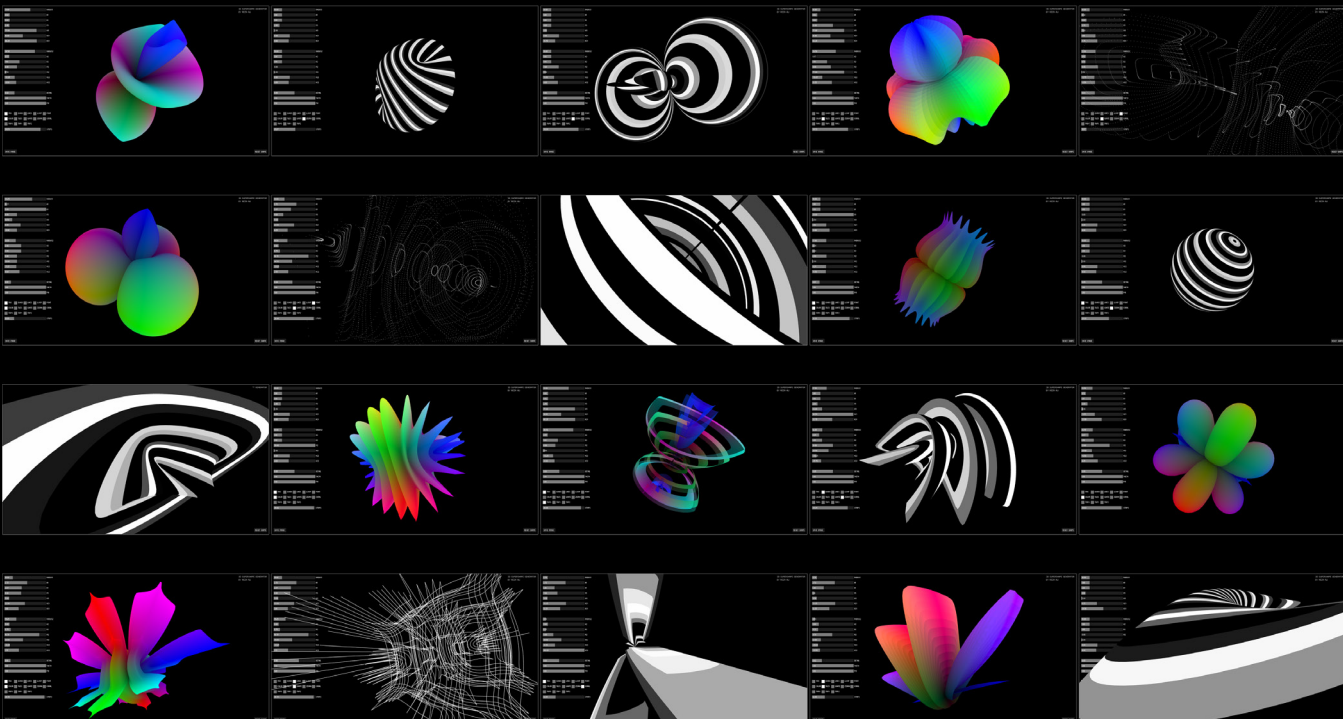


SuperShapes

<http://www.syedrezaali.com/blog/>



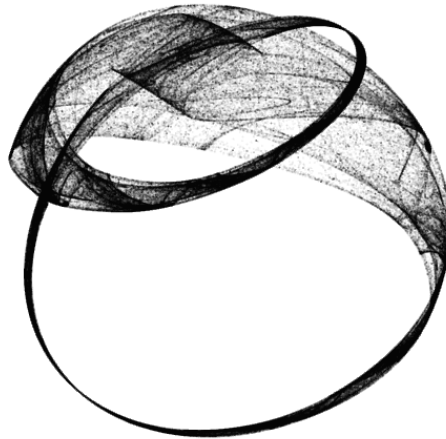
Reza Ali is a media artist that creates content for interactive controllers in multimedia performance systems, creates new and fun models of interaction, creates form through algorithmic processes, creates real-time computer graphics for virtual worlds, and explores the realm of science and mathematics to make complex phenomena understandable and intuitive.



Normalized

| | |
|----------|----------------|
| 25000.00 | PARTICLES |
| 50.00 | TRAIL-LENGTH |
| 267.50 | VELOCITY LIMIT |
| 325.00 | SPHERE RADIUS |
| 51.00 | SIGMA |
| 100.00 | RHO |
| 100.00 | BETA |

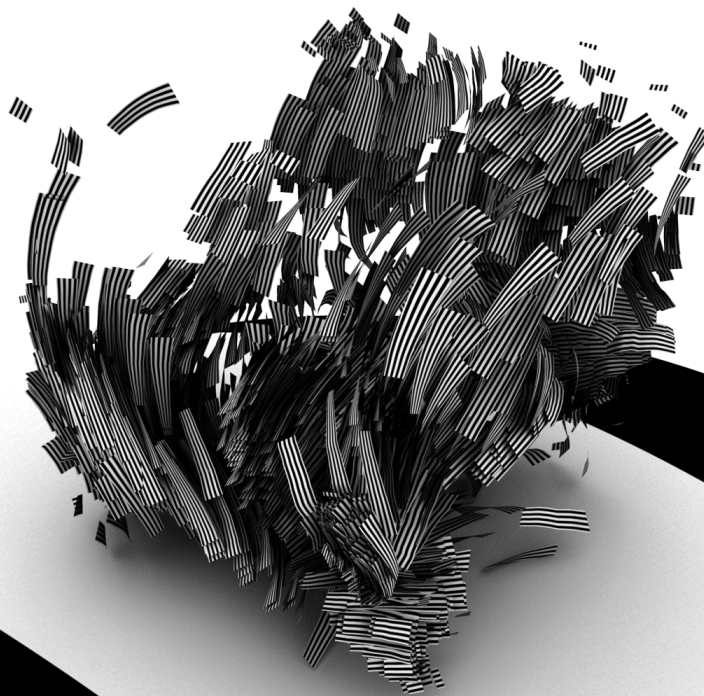
LORMALIZED BY REZA ALI
PRESS 'R' to RANDOMIZE
PRESS 'P' to PAUSE



SAVE IMAGE

RESET PARAMS

3D Field Flow is an exploration of invisible space, fluid flow, thermodynamics and dynamical systems. Empty space surrounds us, however is this space really empty? The space around us is governed by the rules of thermodynamics and physics and shows some interesting behavior when simulated and visualized in 3D. *3D Field Flow* starts to tackle the challenge of making invisible space visible by using a 3D vector field to stimulate a cube of empty virtual space. The flow inside the empty space is made detectable by using a particle system to visualize the ever-changing values of air velocity inside the diffusing 3D field. The interactive installation allows users to brush the virtual 3D field, allowing them to directly affect invisible space. The particle system acts as the medium by which the viewers can realize their presence and affects on the invisible space.



MOS

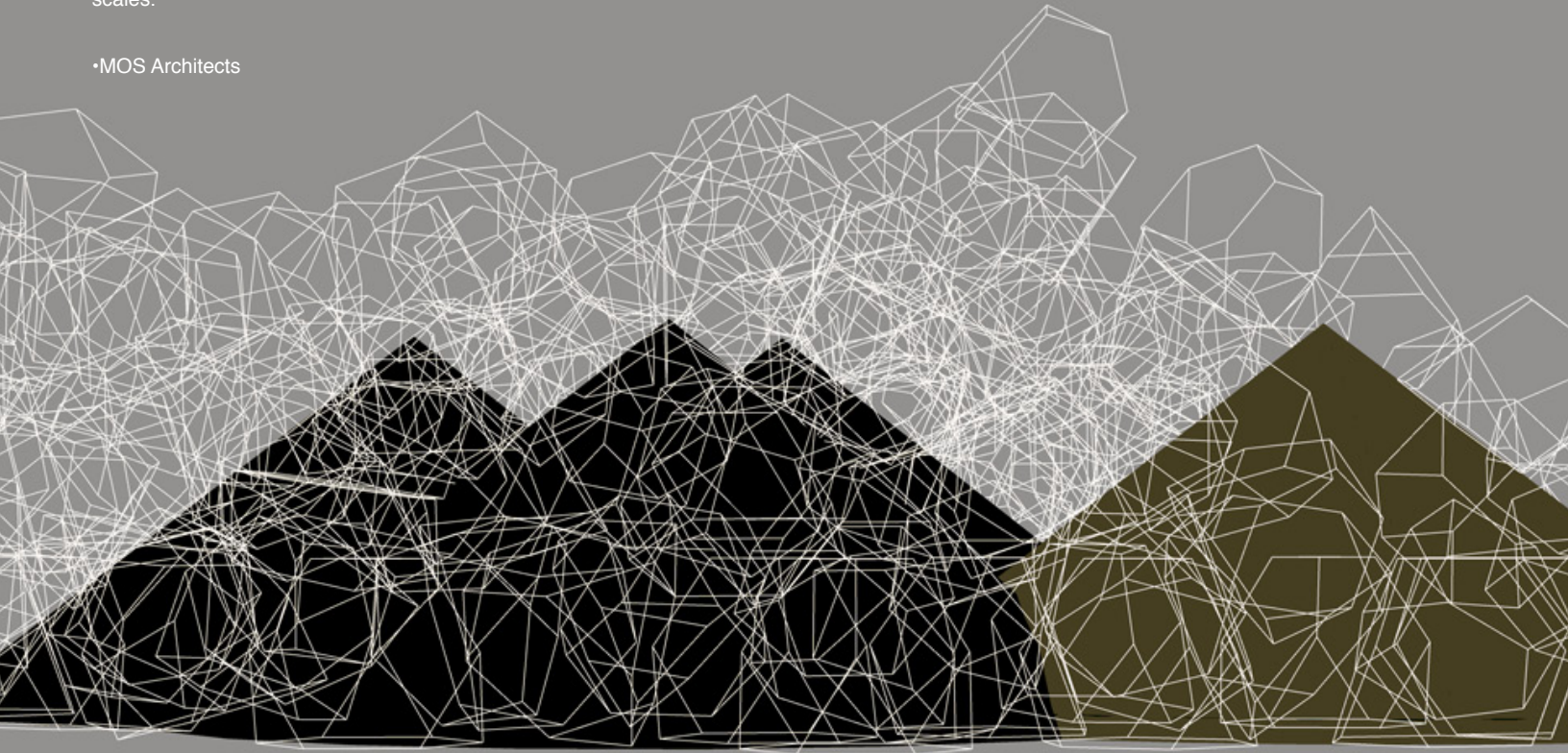
Architects

Michael Meredith, Hilary Sample

www.mos-office.net

"...we engage architecture as an open system of interrelated issues ranging from architectural typology, digital methodologies, sustainability, structure, fabrication, materiality, tactility, and use, as well as larger networks of the social, cultural, and environmental. This process of participation and inclusion - radical inclusion - allows MOS to operate, producing and inflecting environments at a multiplicity of scales."

•MOS Architects



-*Critique:* These examples of how a generative program is involved in a process, but there are few examples of built work using these strategies. Can these images have valid results once materialized in a physical form?

“Software

Notes:

The Beaux-arts pedagogy so deeply impressed a two-dimensional model of composition on architecture that we continue to largely rely on orthographic plans and elevations today. Their abstract representational conventions presented complexity in terms of proportion, symmetry, axes, figures, grids, repetition, *poché* and scale, confining the routines of architectural thought to the formal arrangements of part-to-whole. This flattening was of course encouraged over time because it allowed architectural designs to achieve portability and operational efficiency. It was the primary medium of architecture. Importantly, it produced a mechanical datum -- a playing field -- in which all buildings could be evaluated against each other.

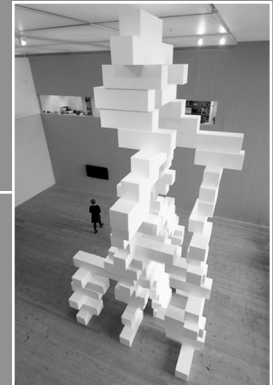
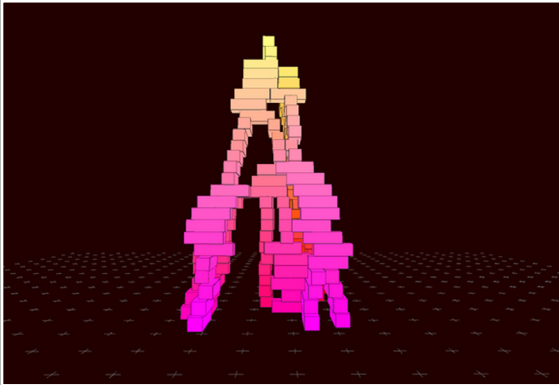
This abstraction initially allowed architectural designs to be exchanged in the same way as paintings: compositional imagery which encouraged and illustrated discourse. The de-skilling of the Beaux-arts plans into reductive diagrams as the generators of design strategies has further detached representation from the material configurations they organize. Coupled with the rise of photographic realism as the means of blogged and googled architectural discourse, this procedure has shifted the discipline toward a more diffuse relationship with its representational medium.

Computational tools have allowed architects to grasp and articulate data in ever-expanding ways. Previous generations of architects used digital technology to examine design as three-dimensional form and complex spatial geometry. This residual formal emphasis projected the Beaux Arts two-dimensional discourse into the third and fourth dimensions without questioning the premise of architecture's formal-painterly bias in relation to other flows and forces. At MOS, we are interested in using the diffusion of representation allowed by computation to reexamine the social, cultural, political and economic bandwidth of architectural activity. Our work aims to shift what has been an inward art-historical discourse toward a fuller consideration of structure, weight, balance, friction, and materiality, not in order to reconstitute an 'authentic' humanist endeavor, but as a way of fundamentally rethink modes of 'composing' our environments.

Design has ceased to be solely based upon hyperbolic anxieties of form, where avant-garde practices must constantly seek new means of escape from previous status quo methodologies. Today architecture must enter larger contests that treat software as a necessary tool for constructing new futures rather than a purely visual novelty. Previous generations of architects had to choose between Art and Life, representation or realism, which we believe is a false choice and no longer relevant given our diffuse immersion in media. The distinction between art and life or autonomy and heteronomy is no longer clear-cut, but rather flattened into this new territory in which we work. Developing software environments permits us to continue the avant-garde mandate of formal experimentation, conjuring new means of organizing matter that is neither purely craft nor composition, but both simultaneously.”

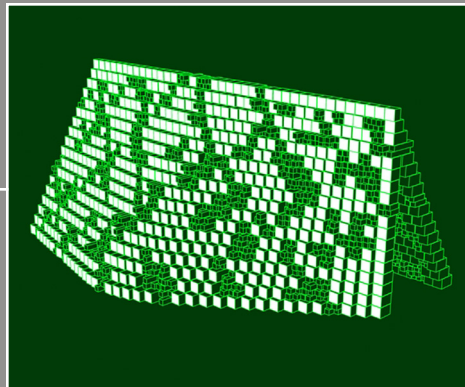
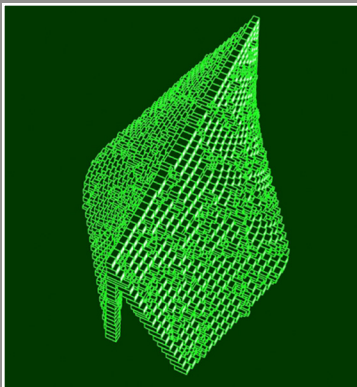
Software

The MOSstack software is for stacking blocks within an environment of forces, gravity. The stacking occurs with a specified random range of overhang between each successive unit. As each unit is stacked it is simultaneously calculating its own self-weight and balance in real-time producing strange structural forms.



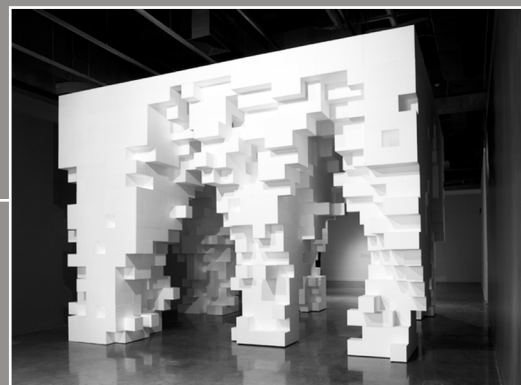
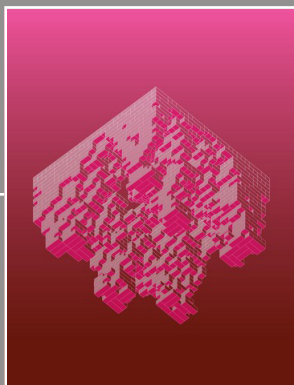
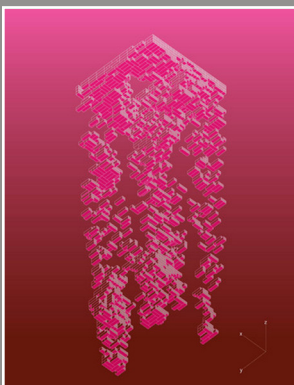
2008 9 Pile .

Part of a series of collaborative installations with the artist Tobias Putrih. This one was for the Boijmans' Museum.



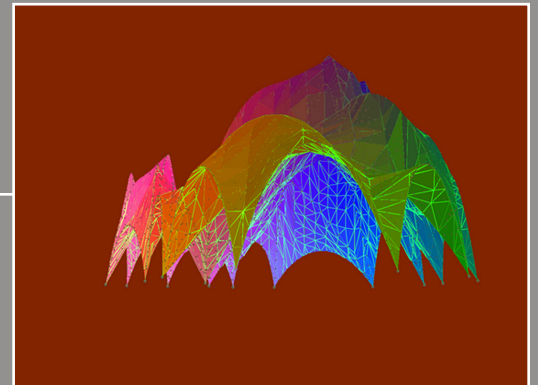
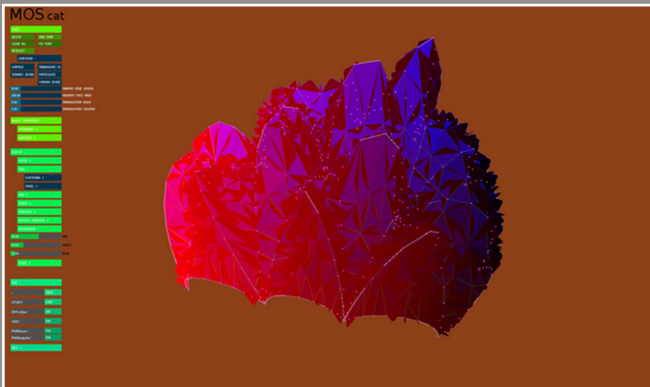
2009 MITList

MosErosion, a collaborative installation with Tobias Putrih

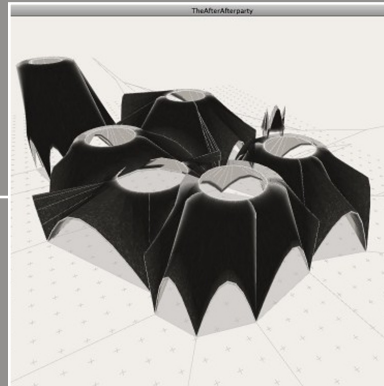


2008 MOScat

Temporary Pavilion for Covent Garden, London

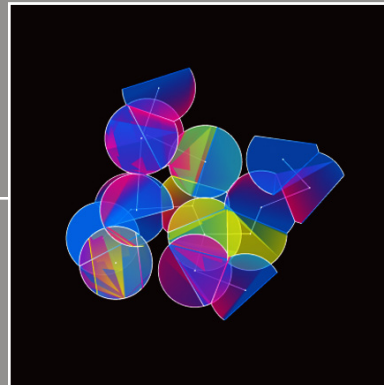


2009 PS1YAP AFTERPARTY



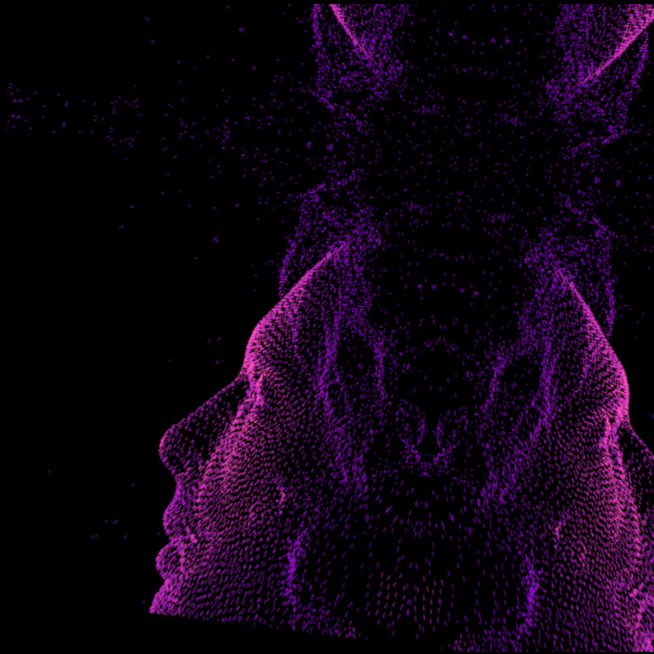
MOS Cell

Michael refers to the structures as "pads," "lillies," or "cells." Each cell may have two or more "legs." A leg is created by folding. If the "length" of the leg passes the "floor height," the leg is folded again, creating a surface that rests on the floor. The applet begins with a single unfolded cell. Dragging the edge of a cell towards its center begins a fold. Right clicking and dragging an edge attaches a new cell. The applet is aware of an invisible "floor," that causes legs to fold twice past a certain length. You'll see legs turning blue once they're folded twice. Right clicking an "edge" causes that leg to become fixed, so that it is always tangent to the ground, even if the floor height changes in the future.



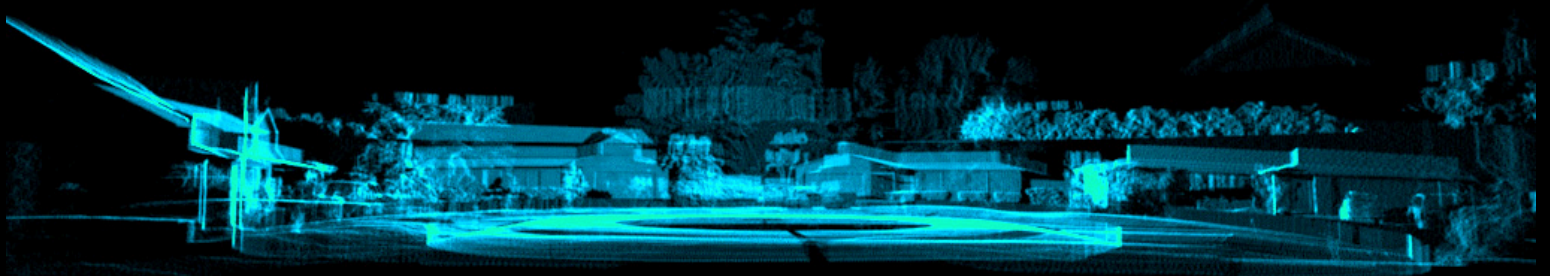
Finding Context

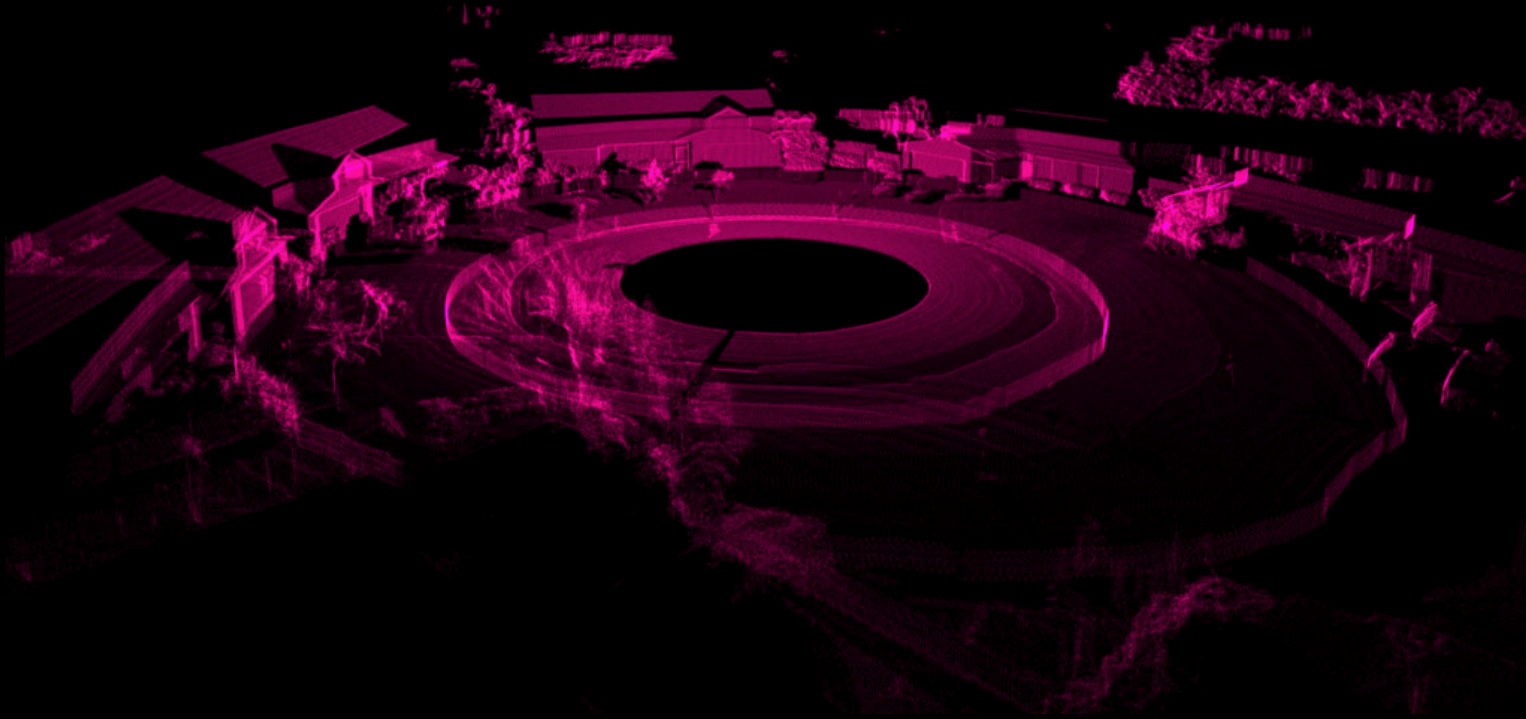
With generative strategies already in place, the unlimited amount of variations of a single script output can question the relativity to project outside academia. Finding Context questions the use of sensory hardware where data can be digitally gathered on site via LIDAR. Once digital pointcloud data of a site is gathered these parameters of the physical site can directly imported to a creative application. This creative application is written from design concepts starting with sketches and finalizing with a parametric interface that has simulated physical forces than can produce generative products with the physics inherently calculated.



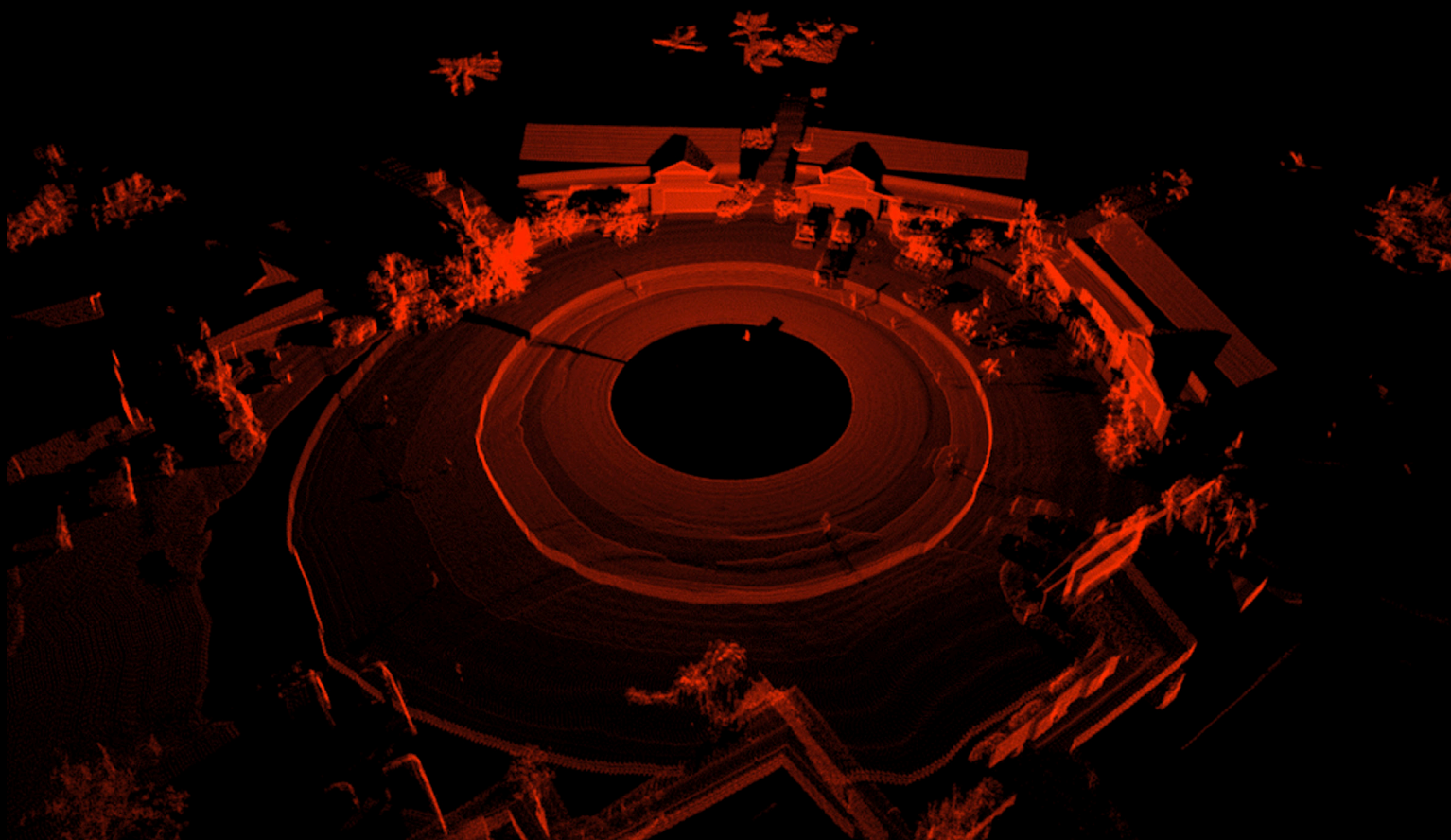
<http://code.google.com/creative/radiohead/>

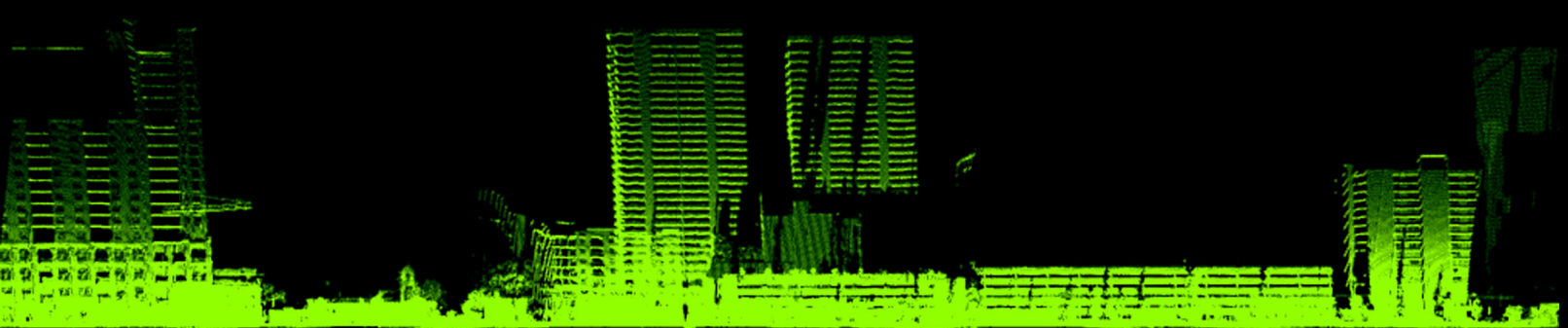
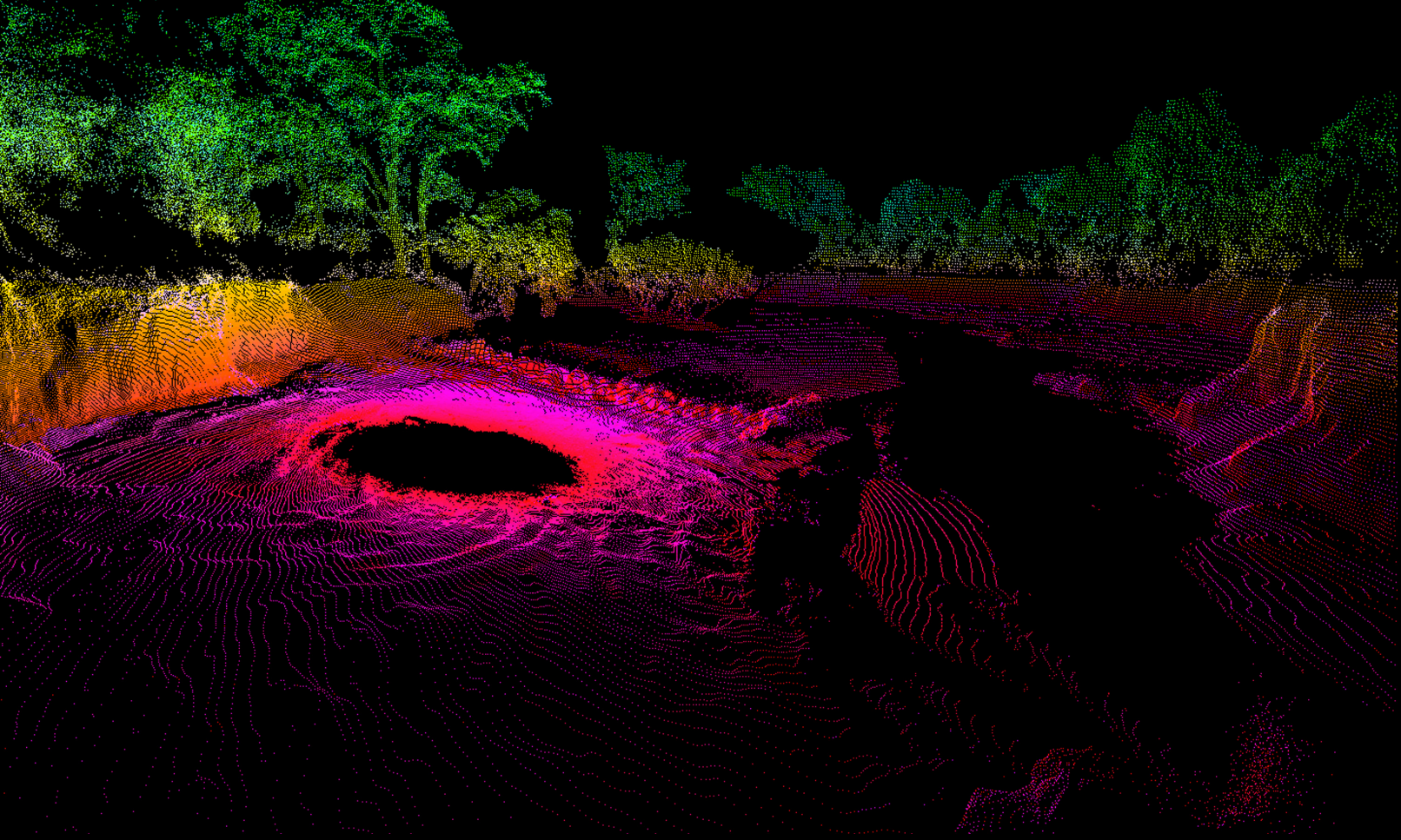
LIDAR (Light Detection And Ranging) is an optical remote sensing technology that measures properties of scattered light to find range and/or other information of a distant target.

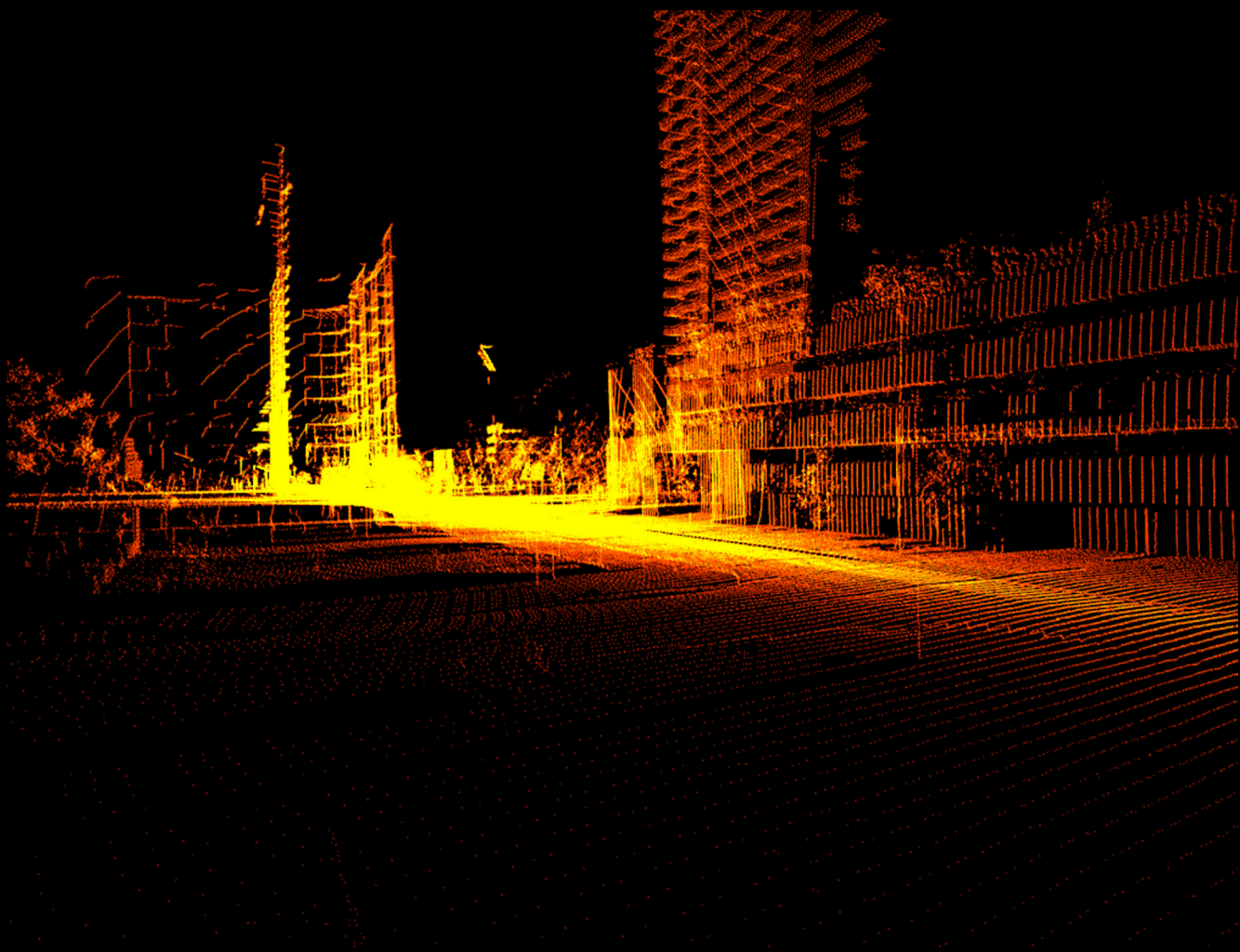
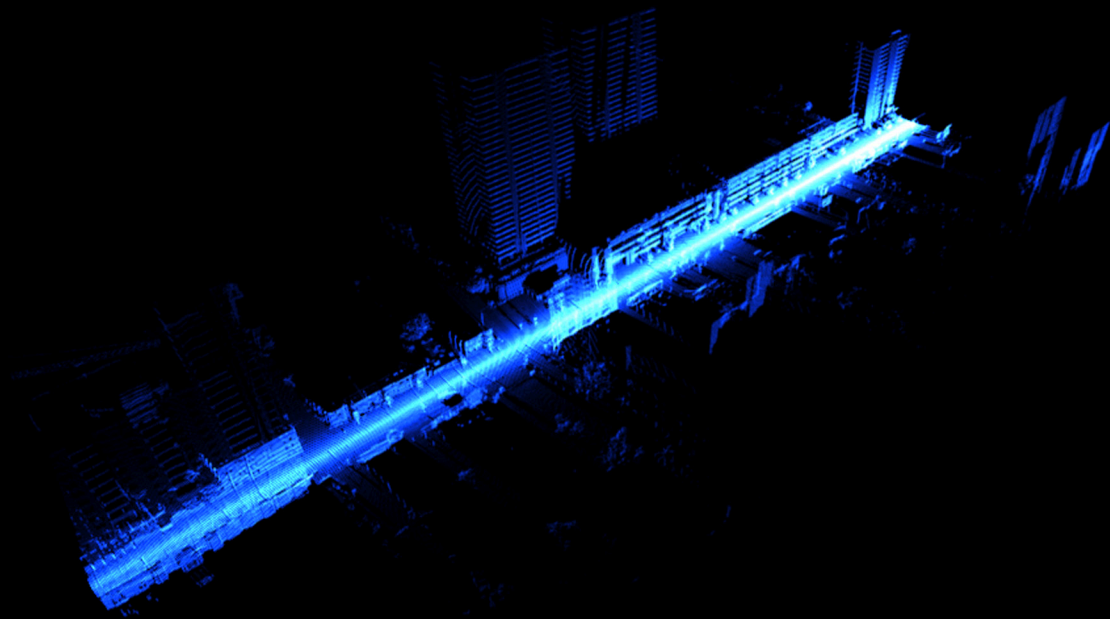




Data obtained by RadioHead House of Cards





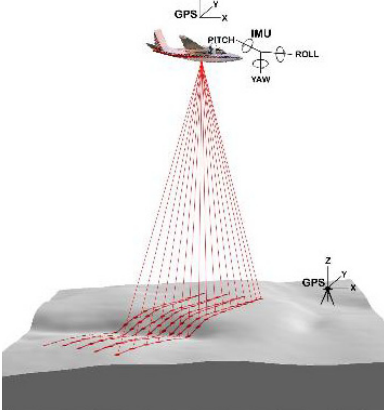


Pointcloud Parametrics

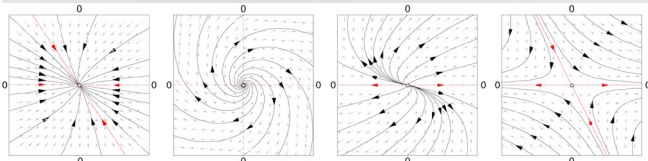
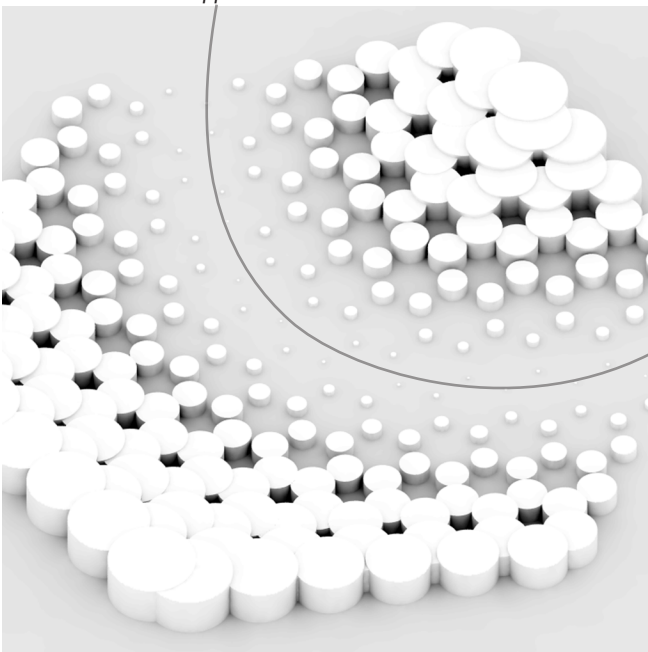
Pointcloud Data Sources:

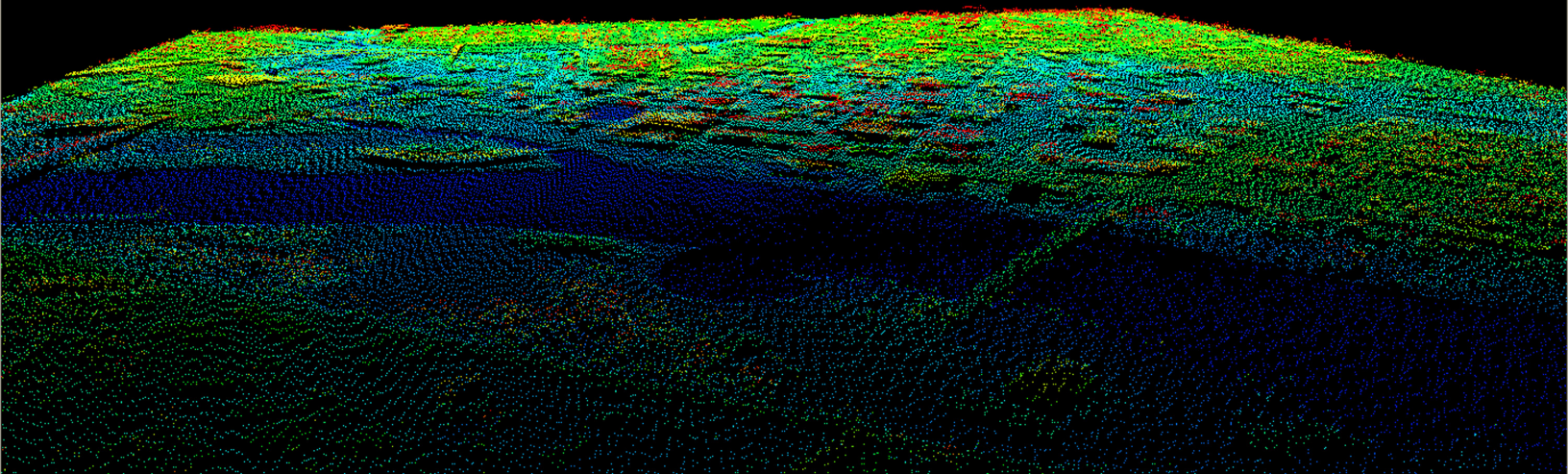


Aerial LIDAR Diagram:

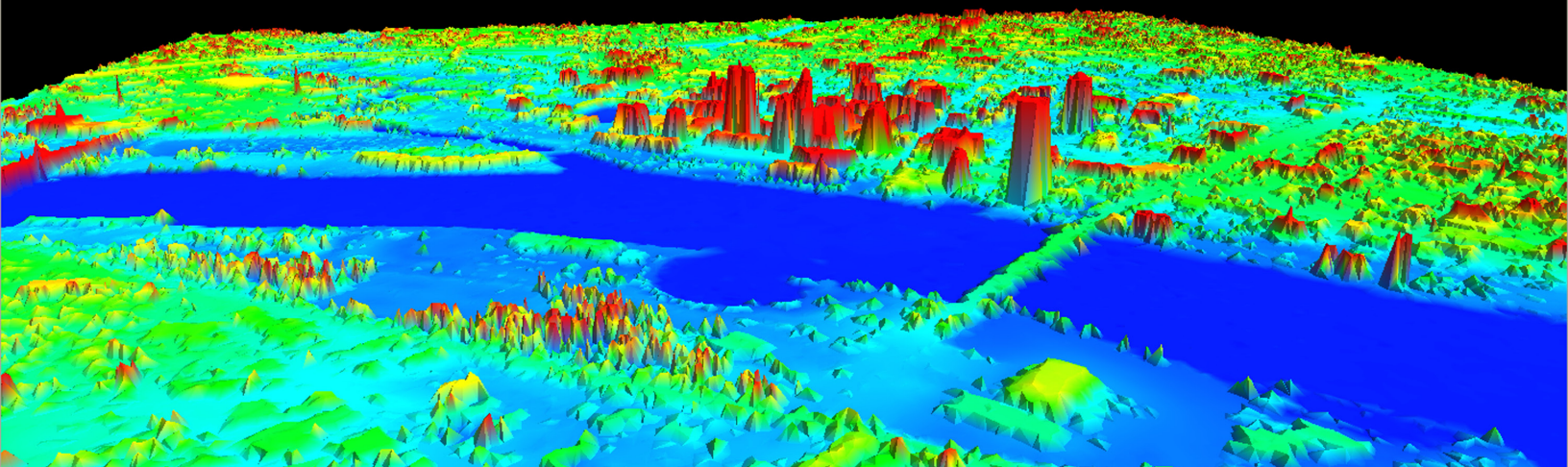


Attractors in Grasshopper:





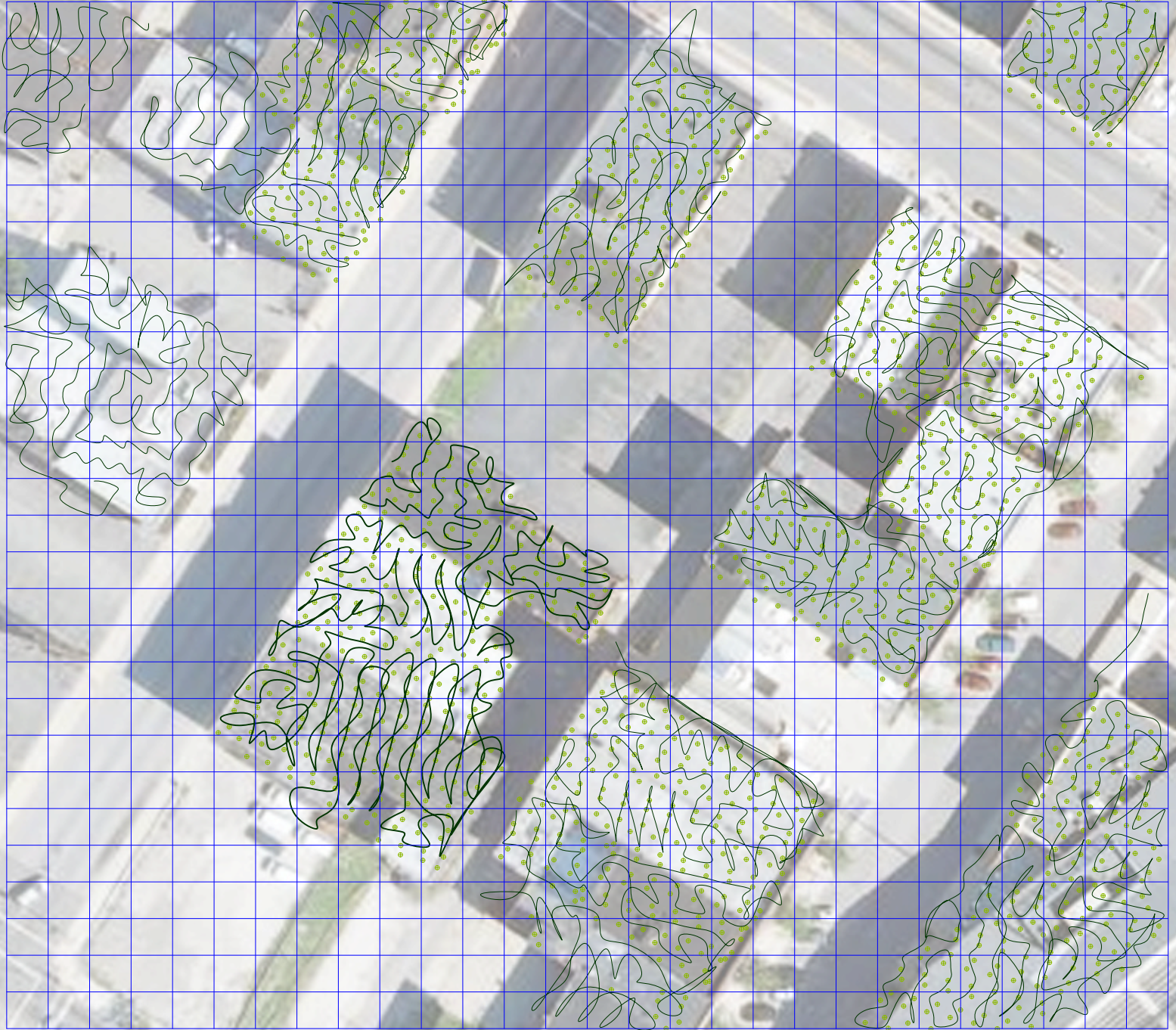
Aerial LIDAR
Raw pointcloud data
Toledo, Ohio



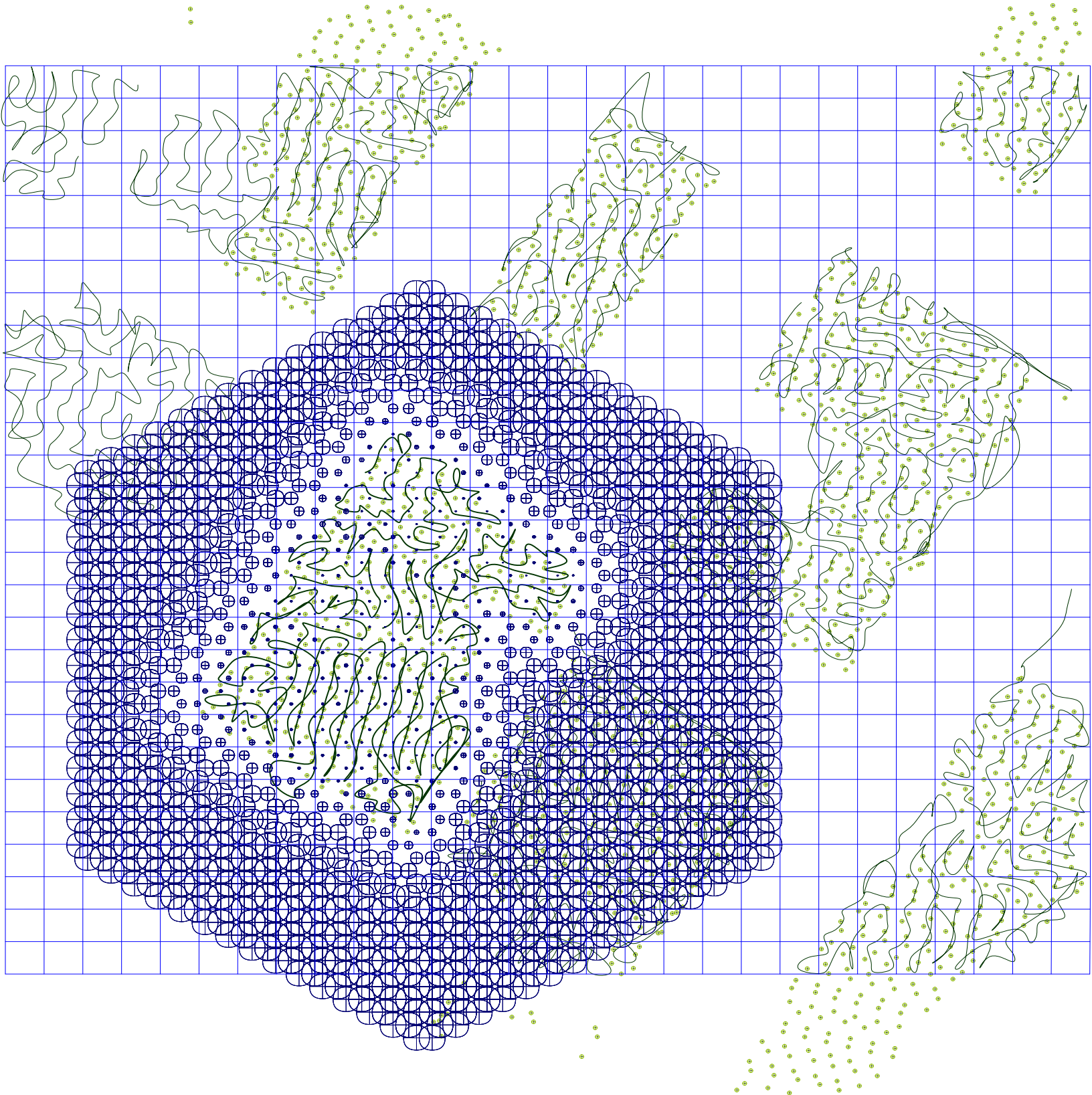
Aerial LIDAR
Toledo, Ohio

Pointcloud

Parametrics

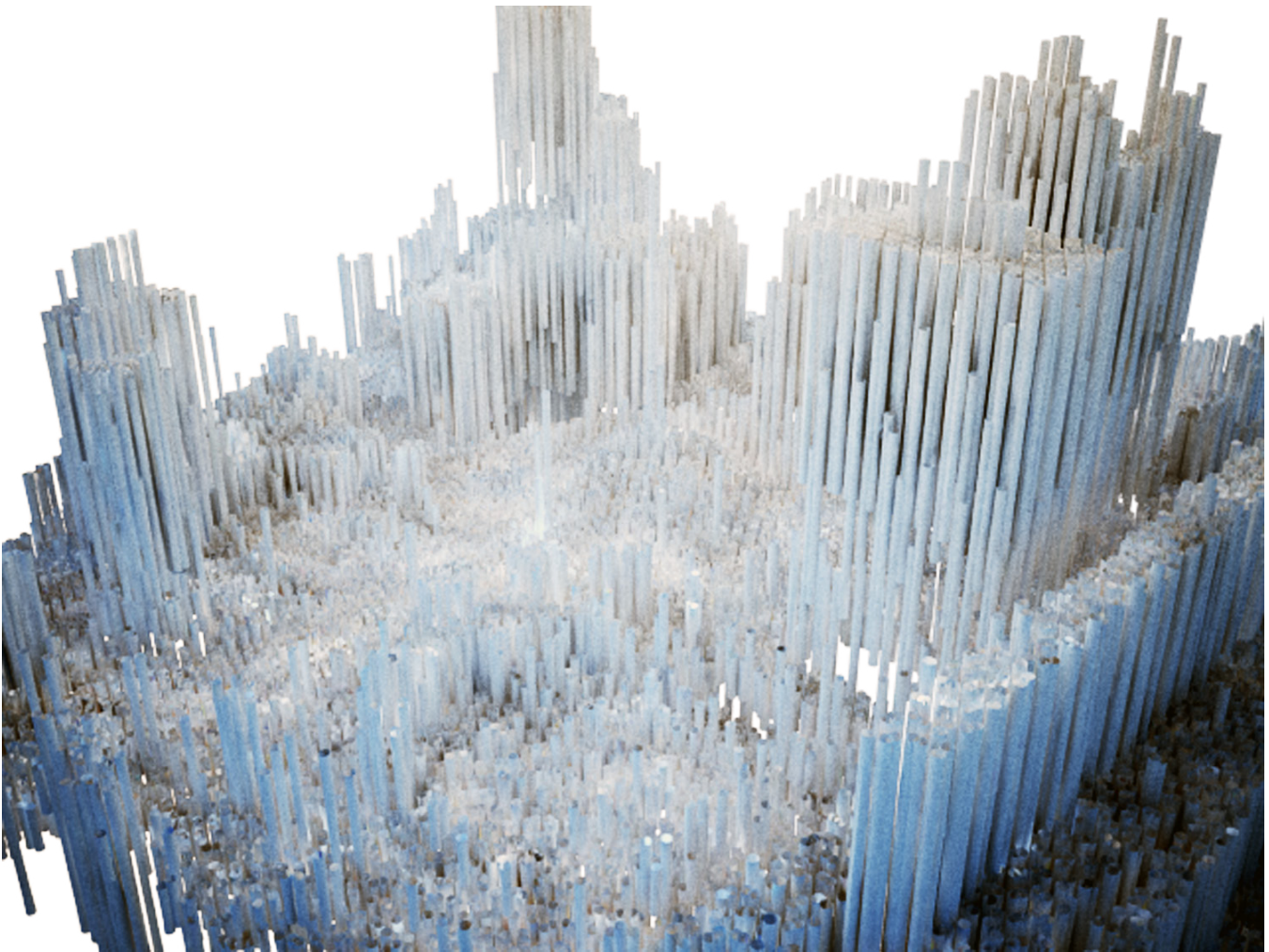
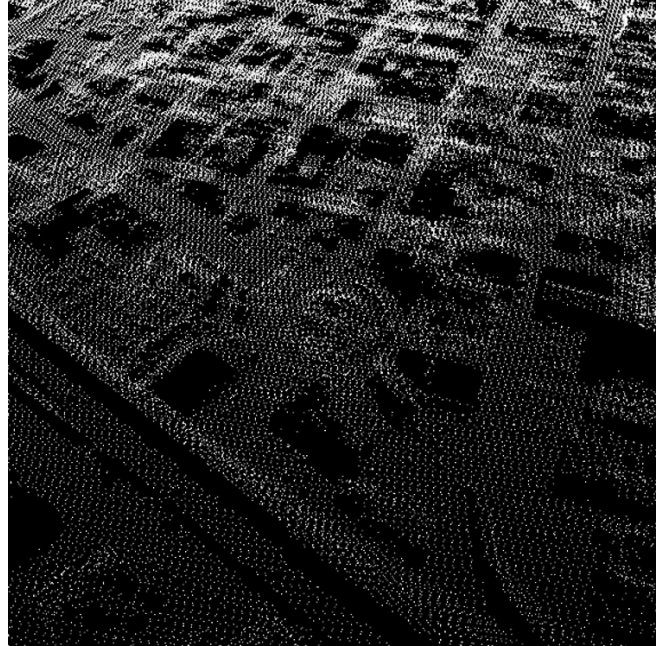


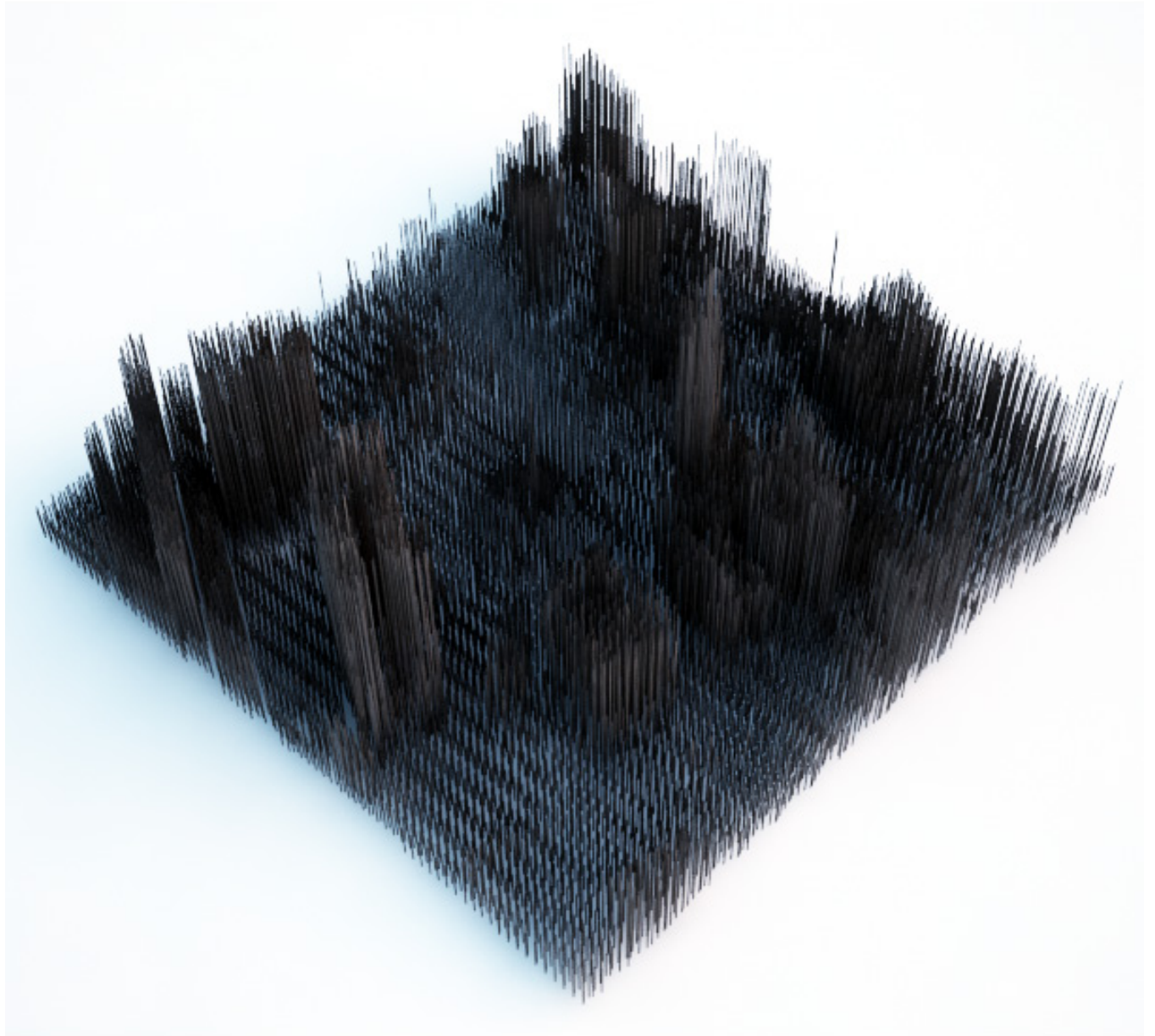
Toledo, Ohio LIDAR Data experiments with Multiple Attractor definitions via Grasshopper. The points are used as guides for attractor lines that can be used for parameters or guides for generative design. Some generative strategies could be zoning lines, views, natural lighting, and other site design factors



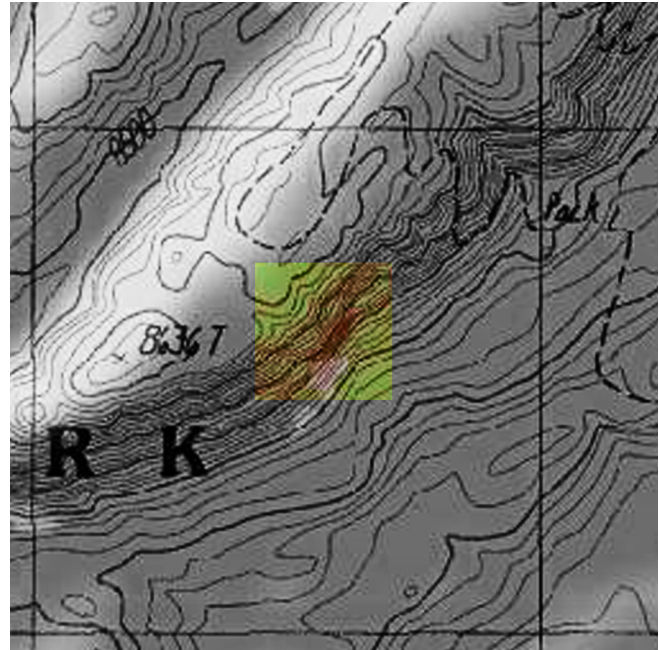
Pointcloud Parametrics

Further research was conducted on a site in New Orleans. Parametric computation is a powerful tool in manipulation of form, but the form is usually unrelated to the site conditions. These Pointcloud Parametric studies began with finding new ways of parametric computation that connected to the physical world and are not conceived in the digital world. Starting from physical sites or objects, this scanned data has high value in a design looping cycle between the physical and digital. These test studies attempted to manipulate current form of the pointcloud data on an existing site. The results being that of an abstract extruded site model.

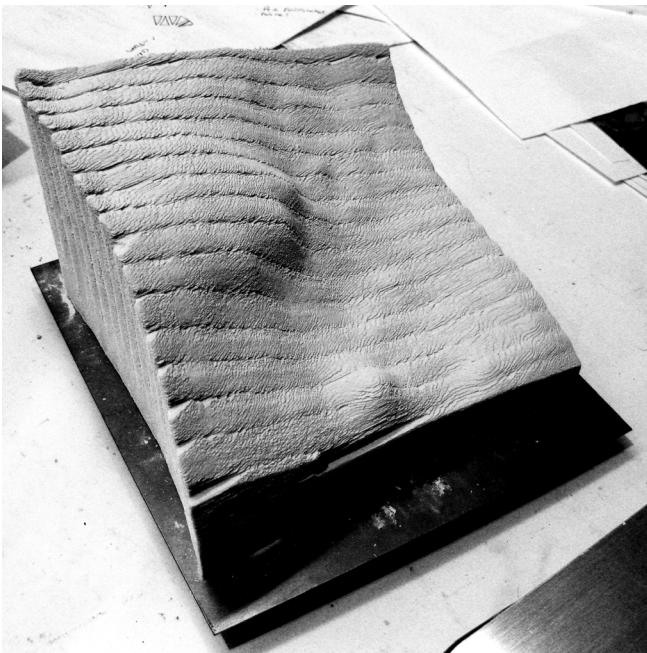




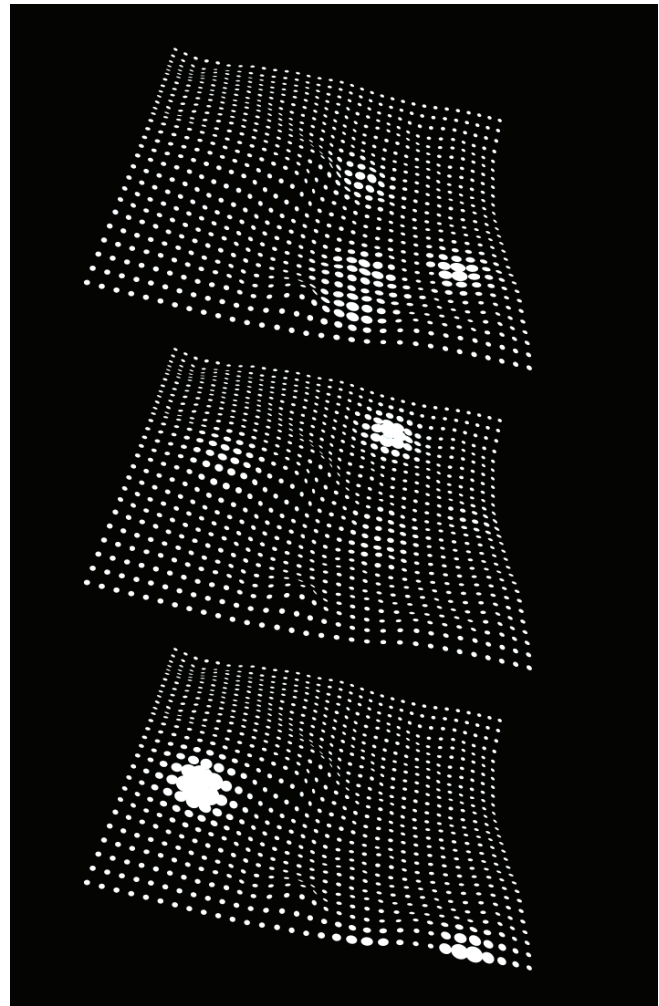
Pointcloud

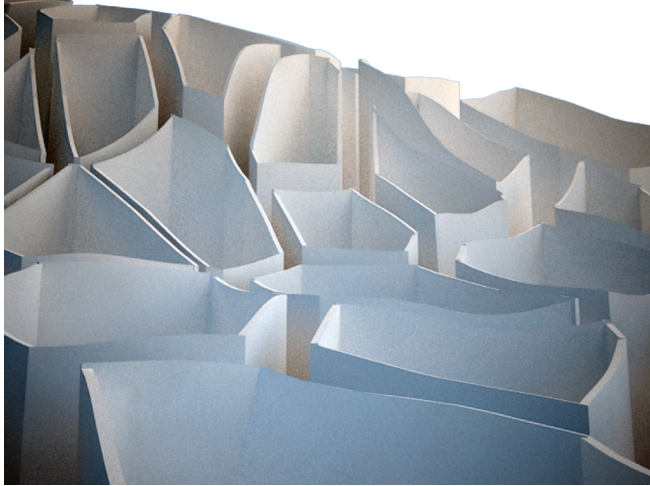


Obtaining new data from Open Topography located at Yellow Stone National Park, further research on topography pointcloud conversion to a physical form was the goal. The site selection choice was for greatest elevation change. Process was meshing pointcloud data via RhinoMesh plug-in tool, than 3D Printed.



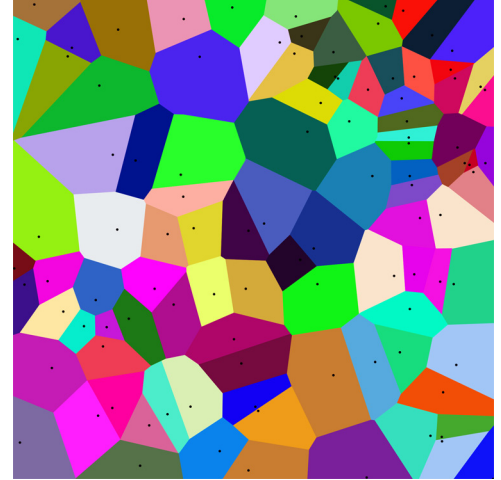
Multiple Point Attractors using pointcloud data converted to a surface



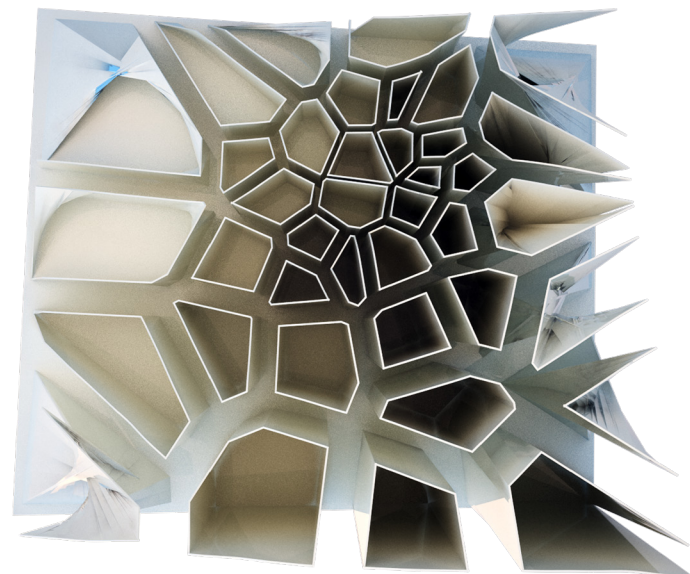
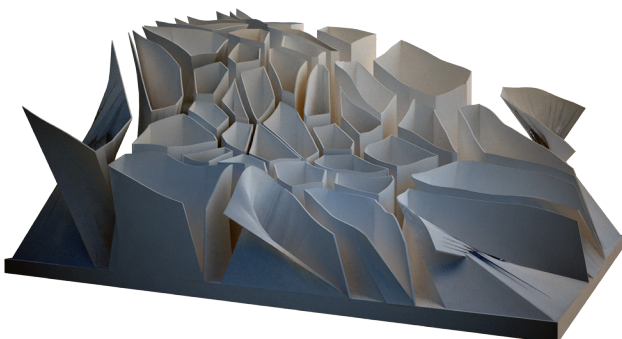
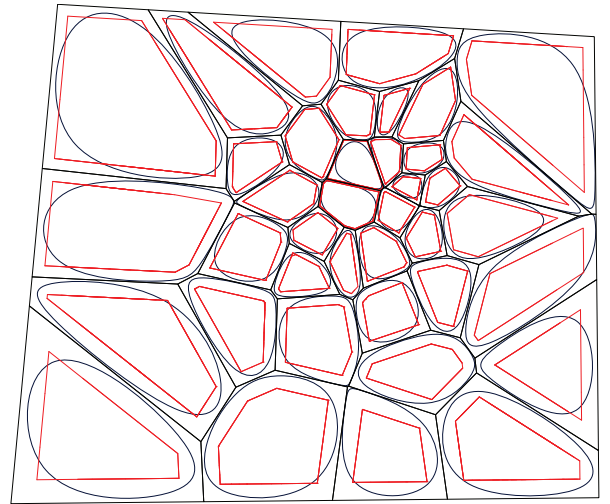


Venormi Grid Grasshopper Definition

Continuing Yellow Stone Site data the outcome was reached by applying parametric definition to surface file. The strategy was experimentation with different forms of data conversion and manipulation.



Venormi Grid Diagram



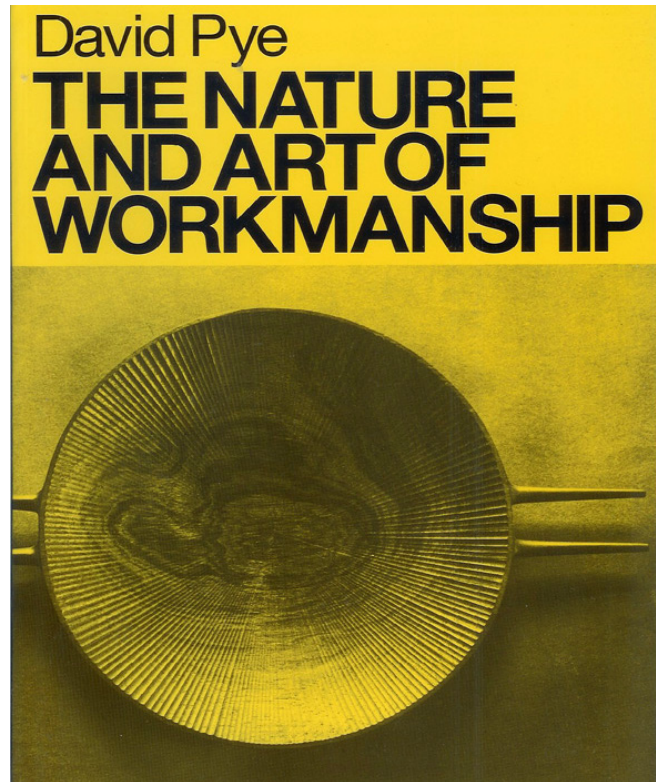
Modern Risk

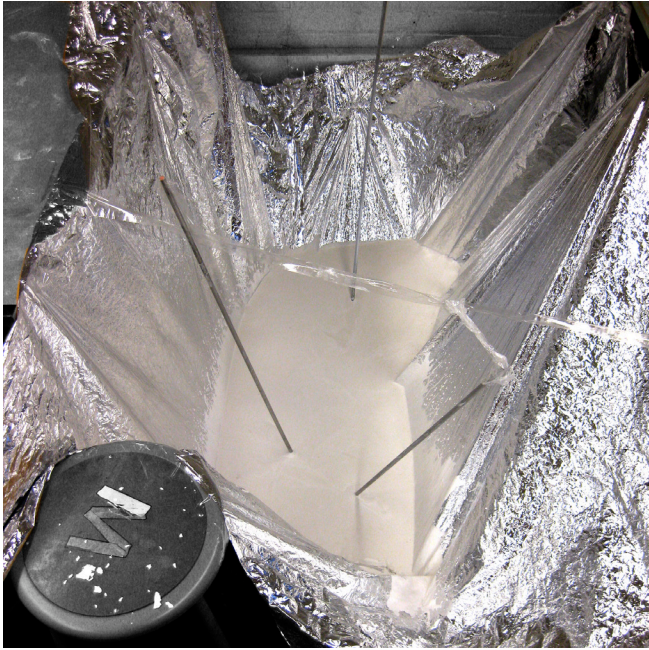
David Pye developed the concept of “the workmanship of risk”. The Nature of Art and Workmanship defines what is valuable in terms of workmanship on two levels: the workmanship of risk, meaning a quality of work dependent on the judgment, dexterity and care with which one works, and the workmanship of certainty, which involves predetermined results before a thing is made, such as in automated production. The essential idea is that the quality of the result is continually at risk during the process of making. A simple physical example of Workmanship of Risk is writing with a pen and of the Workmanship of Certainty, modern printing. Typewriting represents an intermediate form of workmanship, that of limited risk.

Pye defines the designer, circa 1960's, a person or group of people who decide the contents of the drawings and specification: that is to say, decide what information they are to convey. This view of what defines the designer is before modern design computing and it would be interesting to see how Pye would explain modern computing tools. Digital tools do not change the fact that “the intended design of any particular thing is what the designer has seen in his mind's eye: the ideally perfect and therefore unattainable embodiment of his intention. The design which can be communicated — the design on paper, in other words — obviously falls far short of expressing the designer's full intention, just as in music the score is a necessarily imperfect indication of what the composer has imaginatively heard.”

Technique is the knowledge of how to make devices and other things out of raw materials. Technique is the knowledge, which informs the activity of workmanship. It is what can be written about the methods of workmanship. Technology is the scientific study and extension of technique where as workmanship is the application of technique to making.

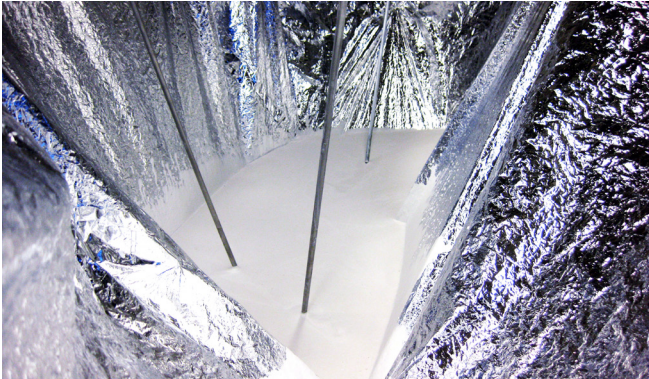
Pye explains that a natural order is reflected in the work of man. In every natural organism we see a dichotomy between idiosyncrasy and conformity to the pattern of the species. No two leaves of the same tree are precisely alike, each is individual: yet every one of them conforms to a recognizable pattern characteristic of the species.



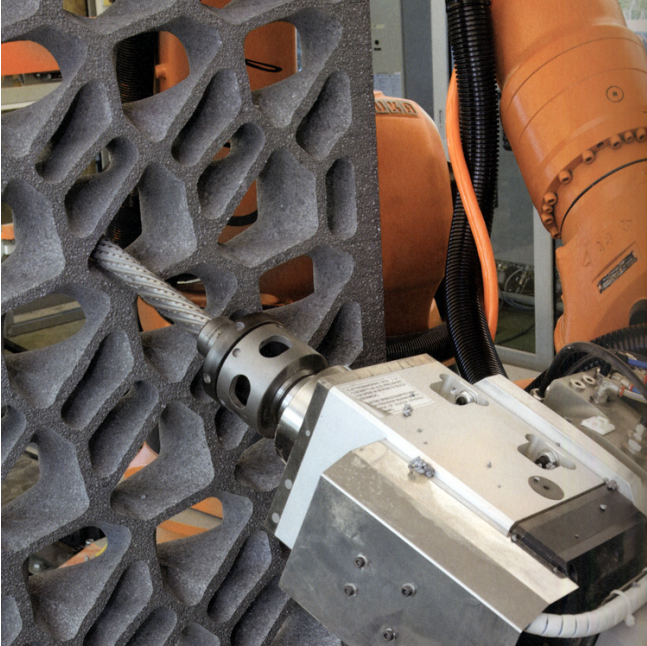


Mylar & Plaster Sculptural Studies

Hardwood Harvesting and Processing Studies

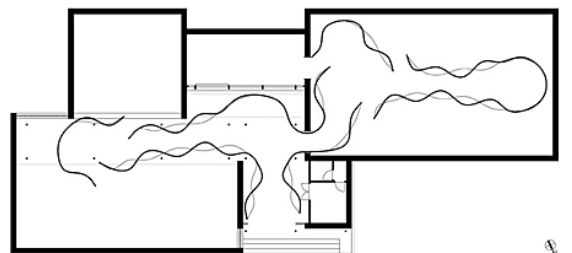
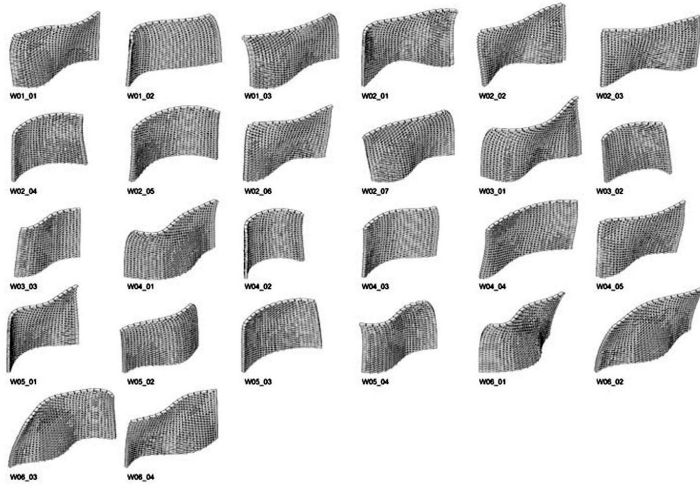


Digital Fabrication



Mtable

Gramazio & Kohler

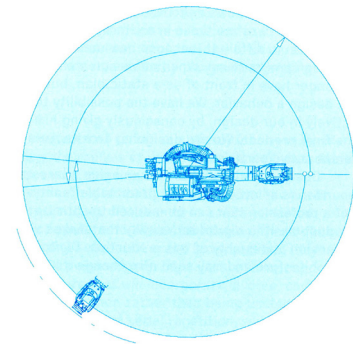
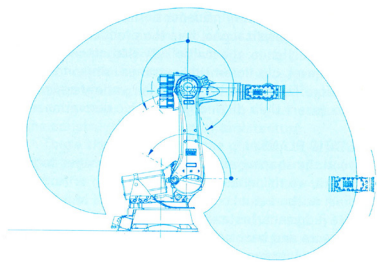
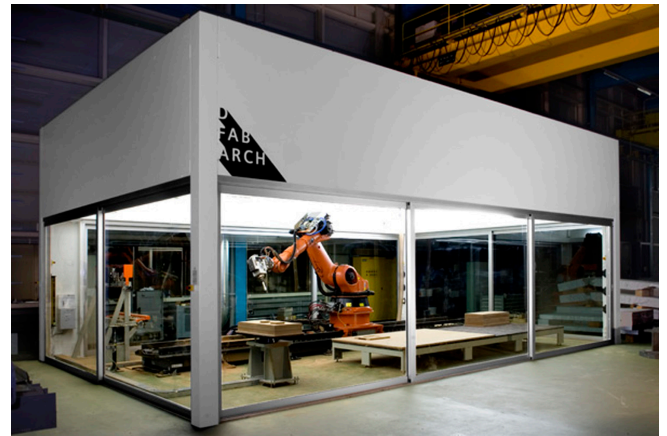
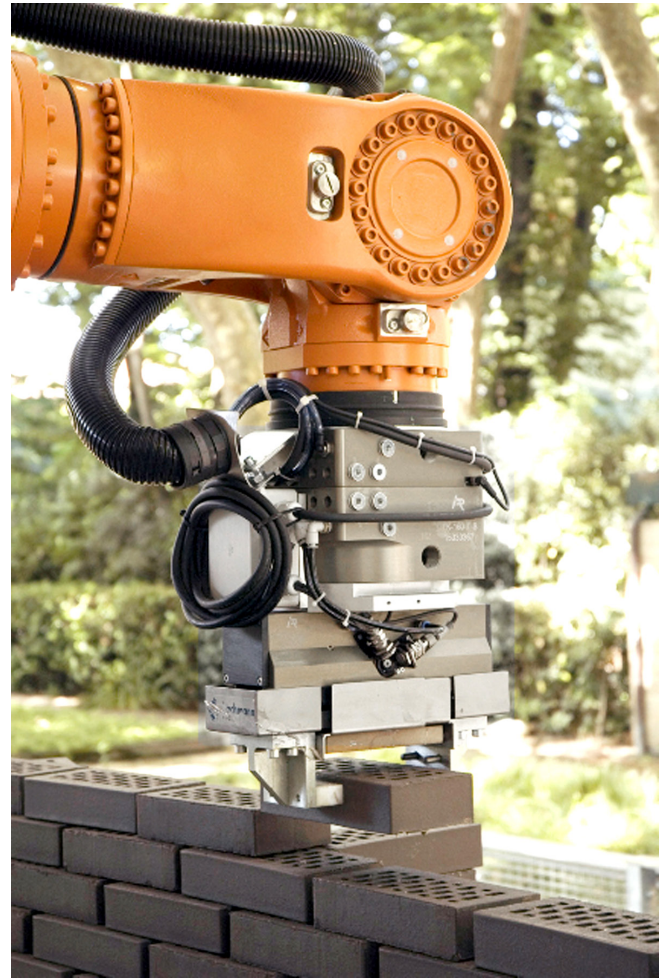


Additive Fabrication

“Worldwide, there are currently more than a million multifunctional robots in use, predominantly articulated-arm robots, and their numbers have risen steadily since the 1980s. The industrial robot has become standard in automation precisely because, like the personal computer, it has not been optimized for one single task but is suitable for a wide spectrum of applications. Rather than being forced to operate within the predefined parameters of a specialized machine, we are able to design the actual “manual skills” of the generic robot ourselves. We do not just steer it to a particular point in space but also determine its capacities for physical manipulation and processing. By defining the robot’s hand and determining its movements, we teach the robot a desired type of construction. We teach it to register its surroundings through sensors, and to affect the environment through the robot hand. The robot thus connects the world of immaterial logic with that of material construction in the most direct way.”

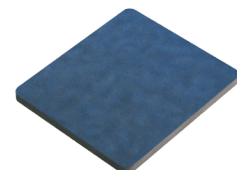
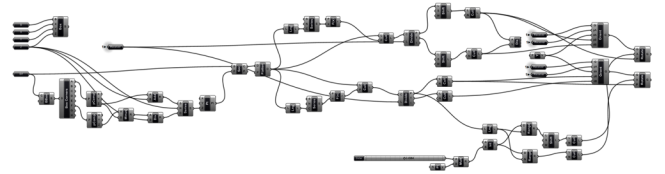
“One might ask whether and why architects should use industrial robots or even computer programming, tools that appear architecturally irrelevant. In our opinion it is crucial that architects, now and in the future, choose their means consciously and master their tools. Accessing these generic tools enables architects to create their individual design instruments and thus generates diverse forms of expression. They will be thereby be in a position to answer contemporary demands with contemporary means and concepts. The fact that no new conventions have arisen in the design and building world in recent decades shows that built architecture has so far benefited only marginally from the digital technologies.”

- Gramazio & Kohler: Digital Materiality in Architecture pp.9



Shed Creator

Speculation: Can this research of robotics be used at the consumer level?





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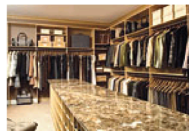
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Shed Creator

Wall Dimensions

Width Height

Bricks per Row

kelesto-Klinker

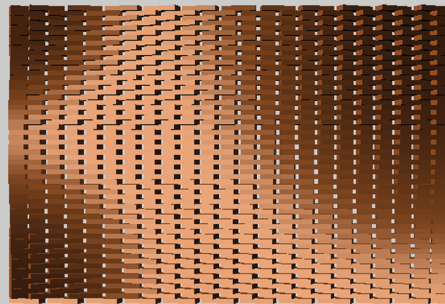
terracotta
310/120...

Image

Load Image

Degree of Rotation

Contrast



Top Front Back Perspective

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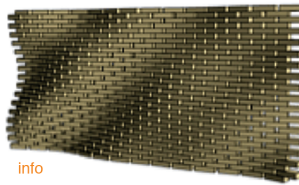
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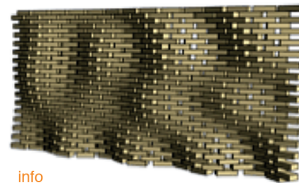
Examples:



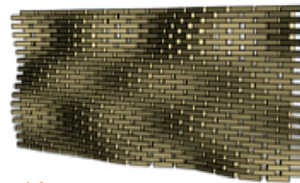
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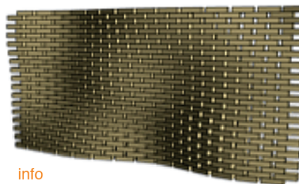
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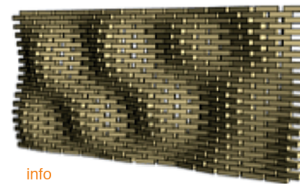
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RepRap

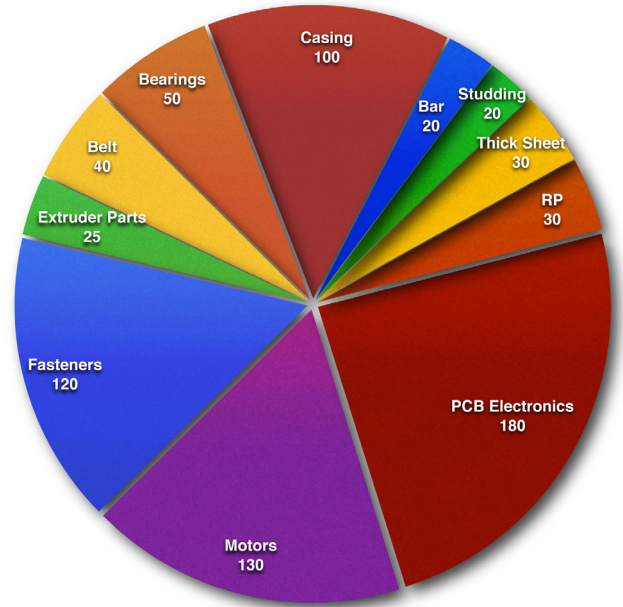
"Think of RepRap as a China on your desktop."

•Chris DiBona, Open Source Programs Manager, Google Inc., April 8, 2008.

RepRap is short for Replicating Rapid-prototyper — a machine that can copy itself. Today, a commercial 3D printer can cost over \$20,000; this limits the number of people with access to this valuable technology. Using thermoplastic extrusion, RepRap aims to develop a robust and affordable desktop 3D printer that is priced lower than \$1,000. These printers are initially targeted at small and mid-size businesses and the education market, constituencies normally precluded from owning rapid prototyping technology due to high costs. The goal is to deliver on a 3D printer to small communities in the developing world as well as individuals in the developed world.

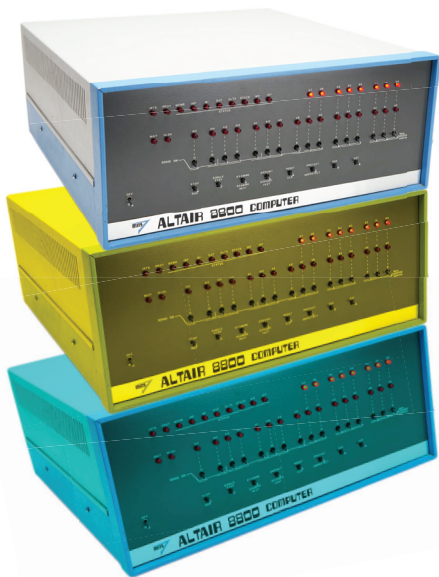
RepRap is free of royalty payments because the project is copyrighted and distributed on the web at no cost under the open source GNU General Public License. Also, because you have free access to all the designs for RepRap, naturally, you can improve them using open source design software.

RepRap Mendel 3D Printer, cost \$745 in 2009

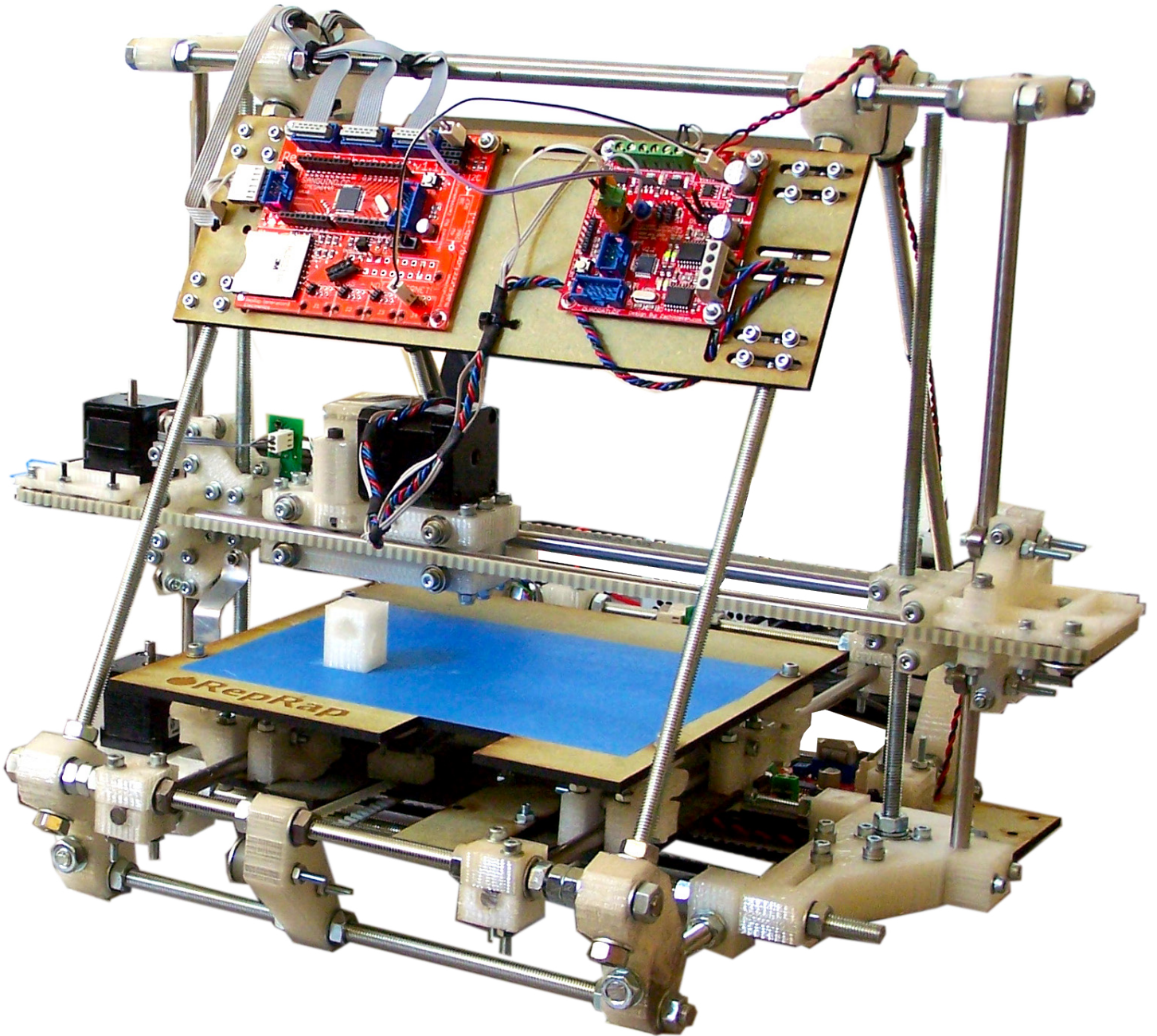


Comparison:

The Altair is widely recognized as the spark that led to the microcomputer revolution. The first programming language for the machine was Microsoft's founding product, Altair BASIC. RepRap is similar to type of discovery and development because it is recognizing a gap at the consumer level in the rapid prototyping market of a low cost 3D printer.



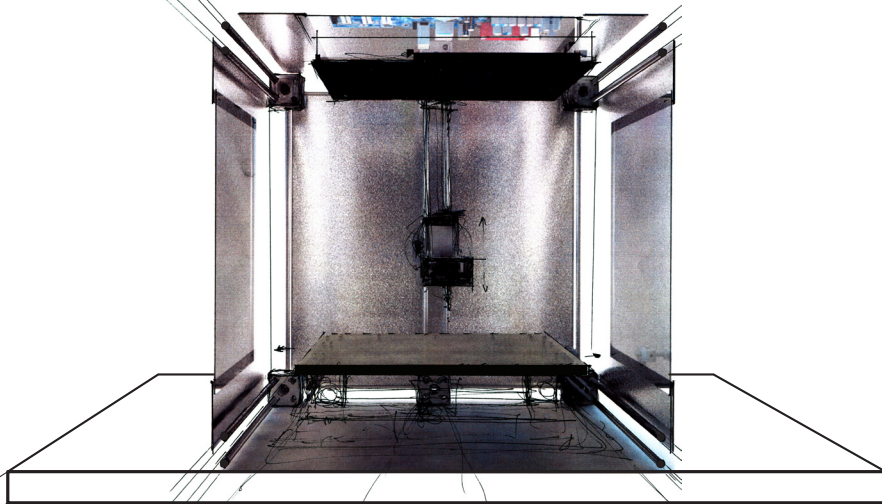
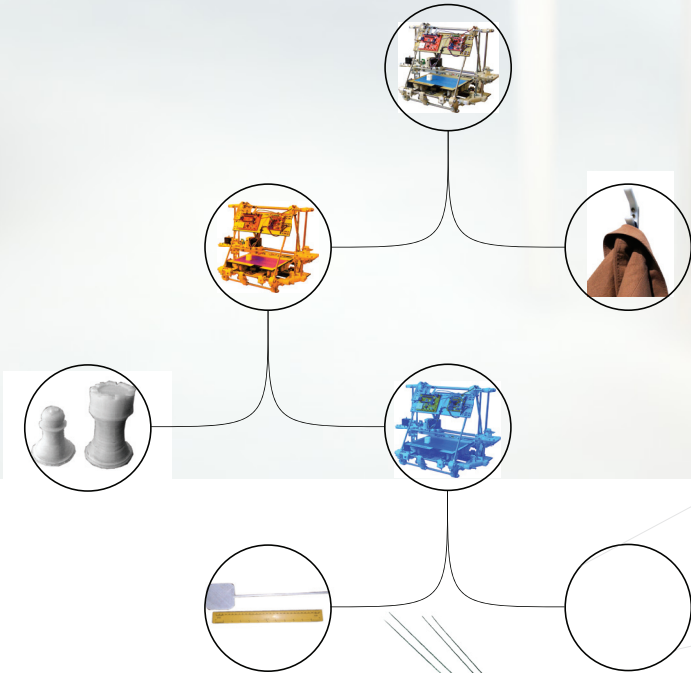
Altair 8800 Computer, cost \$400 in 1975

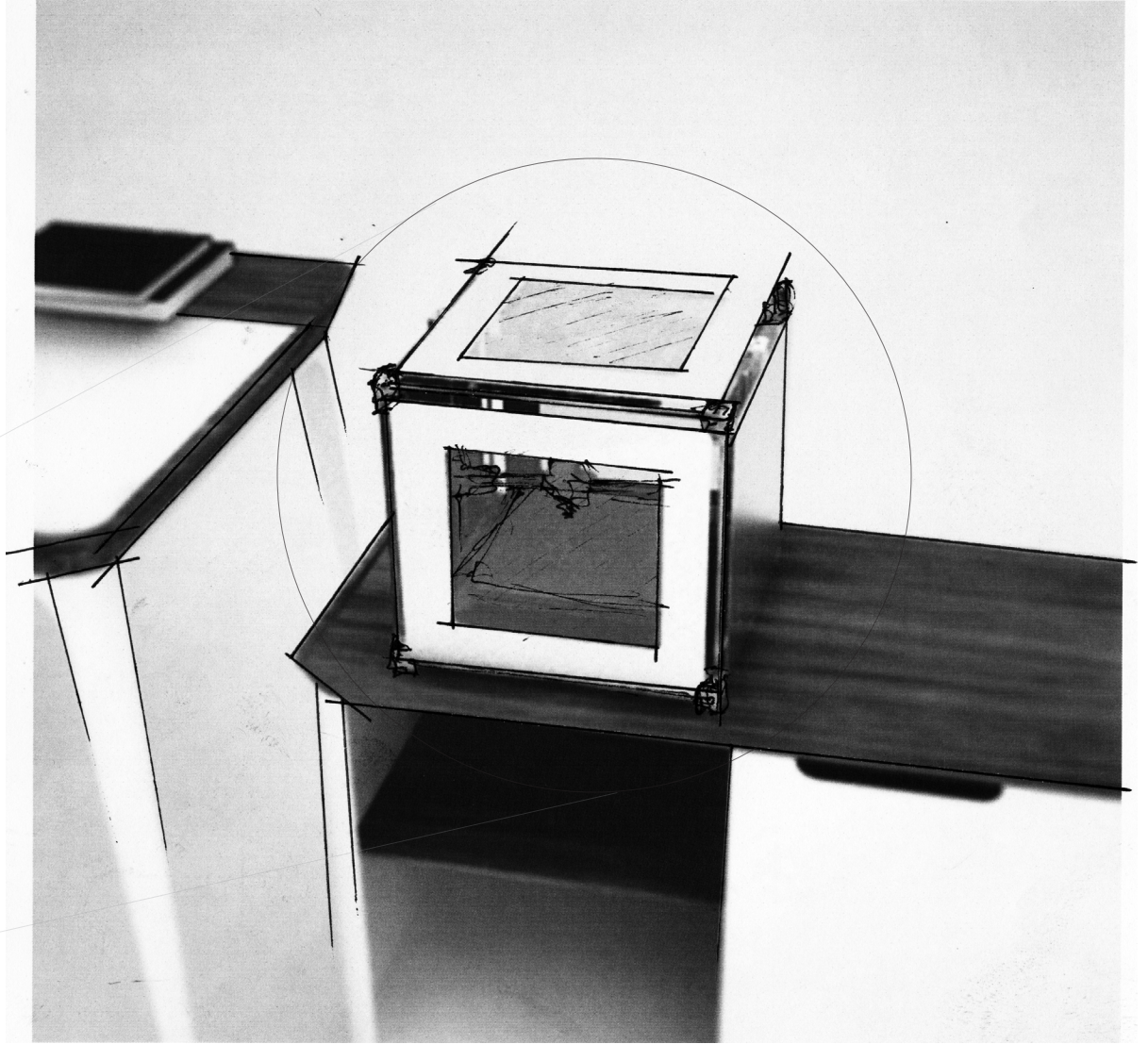


RepRap Home



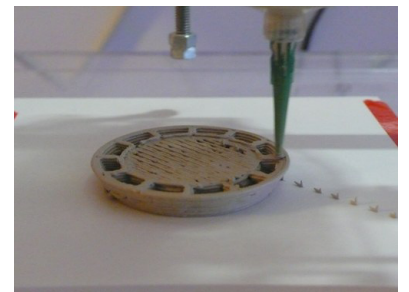
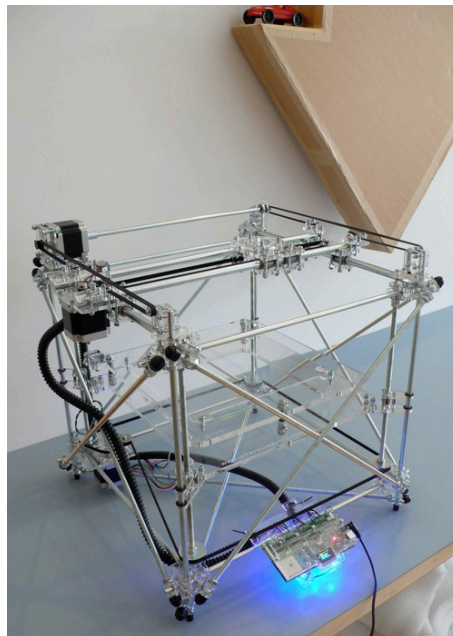
RepRap Family Tree



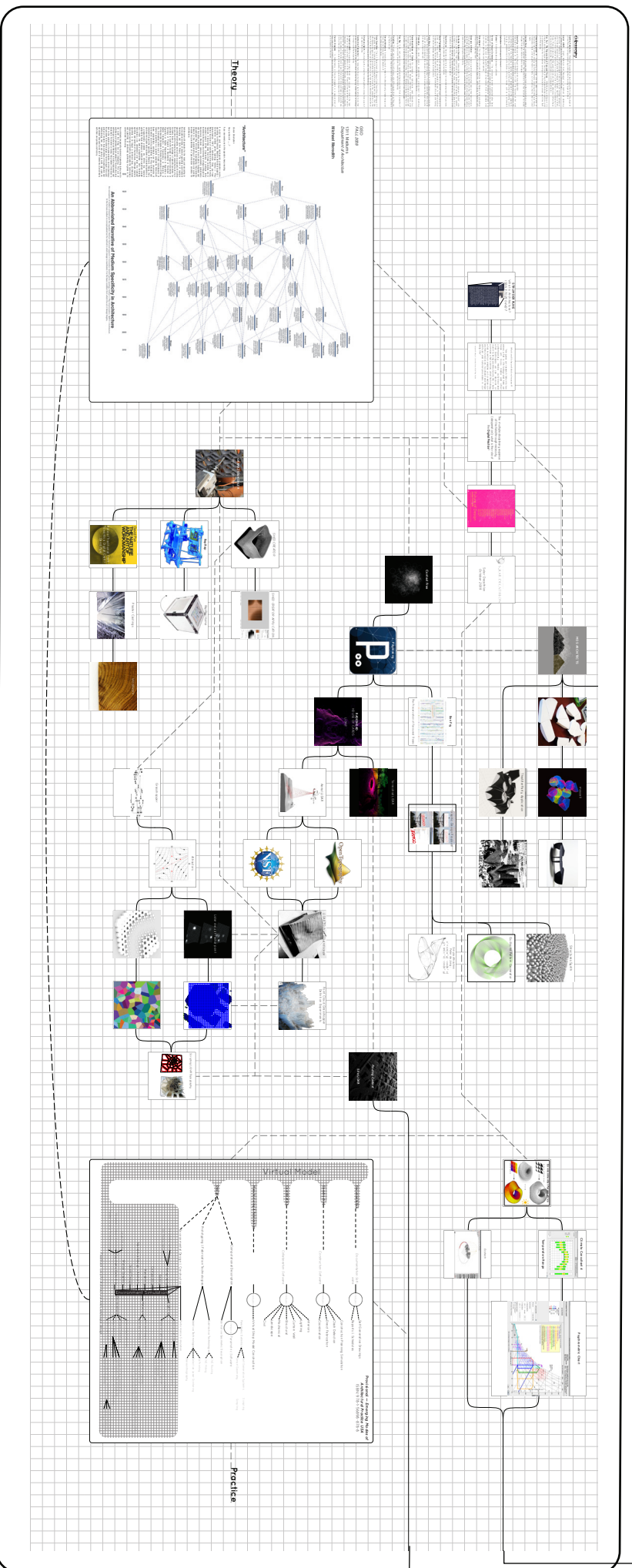


Update

<http://www.unfold.be/pages/projects/items/3d-printer>



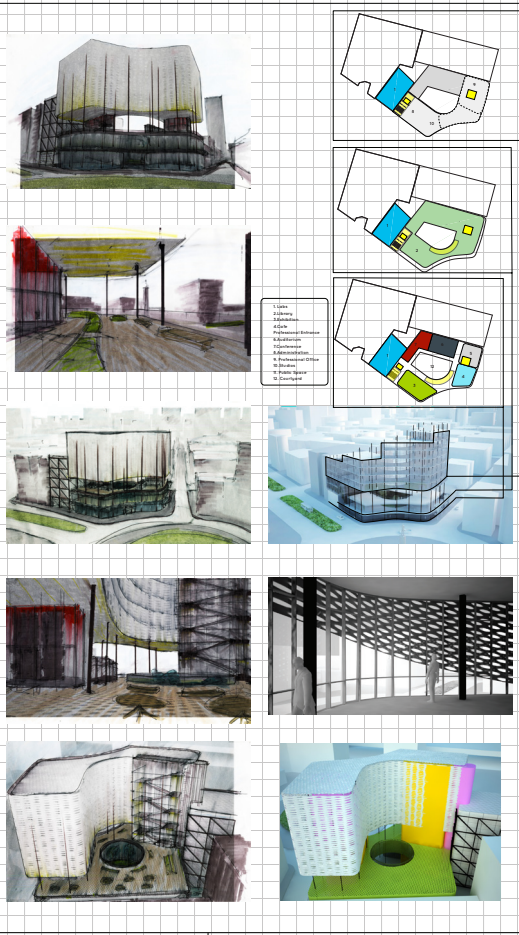
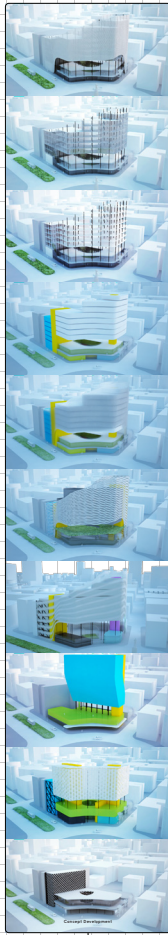
Architecture Research Center



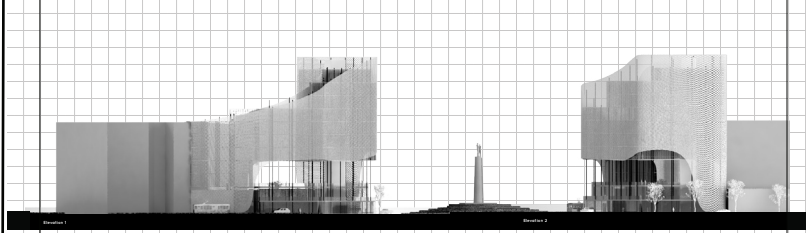
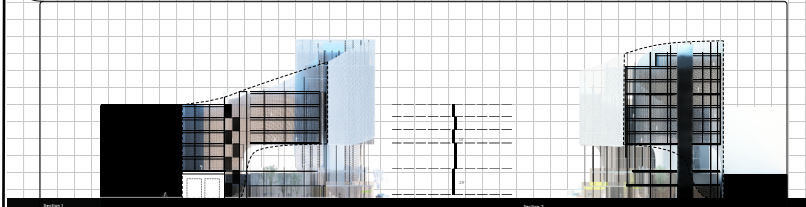
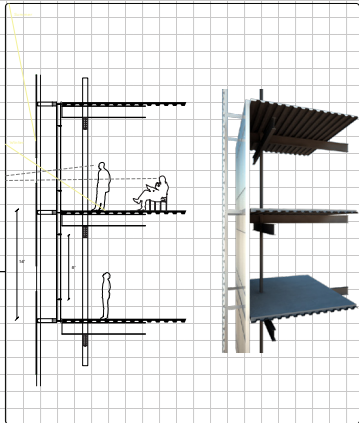
Continuing the theme of architectural research, all the knowledge acquired on digital fabrication and alternative modes of architectural thought, the conclusion an architecture facility. The site selection was consistent with the LIDAR research because of the available data and the push for building or architectural research by the New Orleans Master Plan 2030. The final program was a project to experiment with new digital tools towards an understanding of site, concept, and product.

ARC

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- 3. Auditorium
- 4. Office
- 5. Conference Room
- 6. Reception
- 7. Restaurant
- 8. Storage
- 9. Service Area
- 10. Entrance



Program Statement

ARC

Architectural Research Center New Orleans — Louisiana — USA

The Architectural Research Center, New Orleans, is an international center of education where students are able to explore advanced architectural design. A place where roughly 200 privileged architecture students exchange knowledge and experiences that achieve concept to fabrication in a laboratory setting. Inside the laboratory studios, multidisciplinary professionals guide students towards a new paradigm resulting in emergent architecture, while also being a forum for researchers and collaborators.

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 - Admissions Offices
 - Academic Aptitude Offices
 - Treasury
 - Scholarships Department
 - Direction Offices
 - Services

Investigation & Collaboration:

- Library
- Media-Library
- Group-Rooms
- Individual Investigation
- Periodicals
- Copy-Center
- Computer Room
- Classrooms
- Professors Department

Laboratory Studios:

- Biology Lab
- Genetics Lab
- Botanic Lab
- Mineral Lab
- Water Lab
- Wind Lab
- Sound Lab
- Light Lab

Production:

- Computing Lab
- Modeling Lab
- Fabrication Lab
- Workshop
- Render Factory
- 24/7 Students Room

- Café / Deli

- Aula Magna

- Exhibition Gallery

B



New Orleans Master Plan 2030

The Architectural Research Center would be located in a mixed-use, dense, walkable cultural district that fulfills many propositions provided by the New Orleans Master Plan.

Volume 2, Chapter 9

SUSTAINABLE BUILDING DESIGN AND CONSTRUCTION

5.E Encourage significant job creation in sustainable building design and construction through marketing incentives and workforce training opportunities.

ACTIONS:

- Develop incentives and training for construction companies to adopt advanced construction methods.
- Market New Orleans as a center of advanced building design to attract more companies.
- Build university research capacity in green/advanced building design.
- Provide construction workers with relevant skills.
- Assist design and construction companies to export their expertise to other housing markets.
- Create more partnerships between business and higher education and workforce training programs, to meet growing demand for jobs at all skill levels.
- Advocate with the state to support local community colleges, universities and colleges as critical to future prosperity.

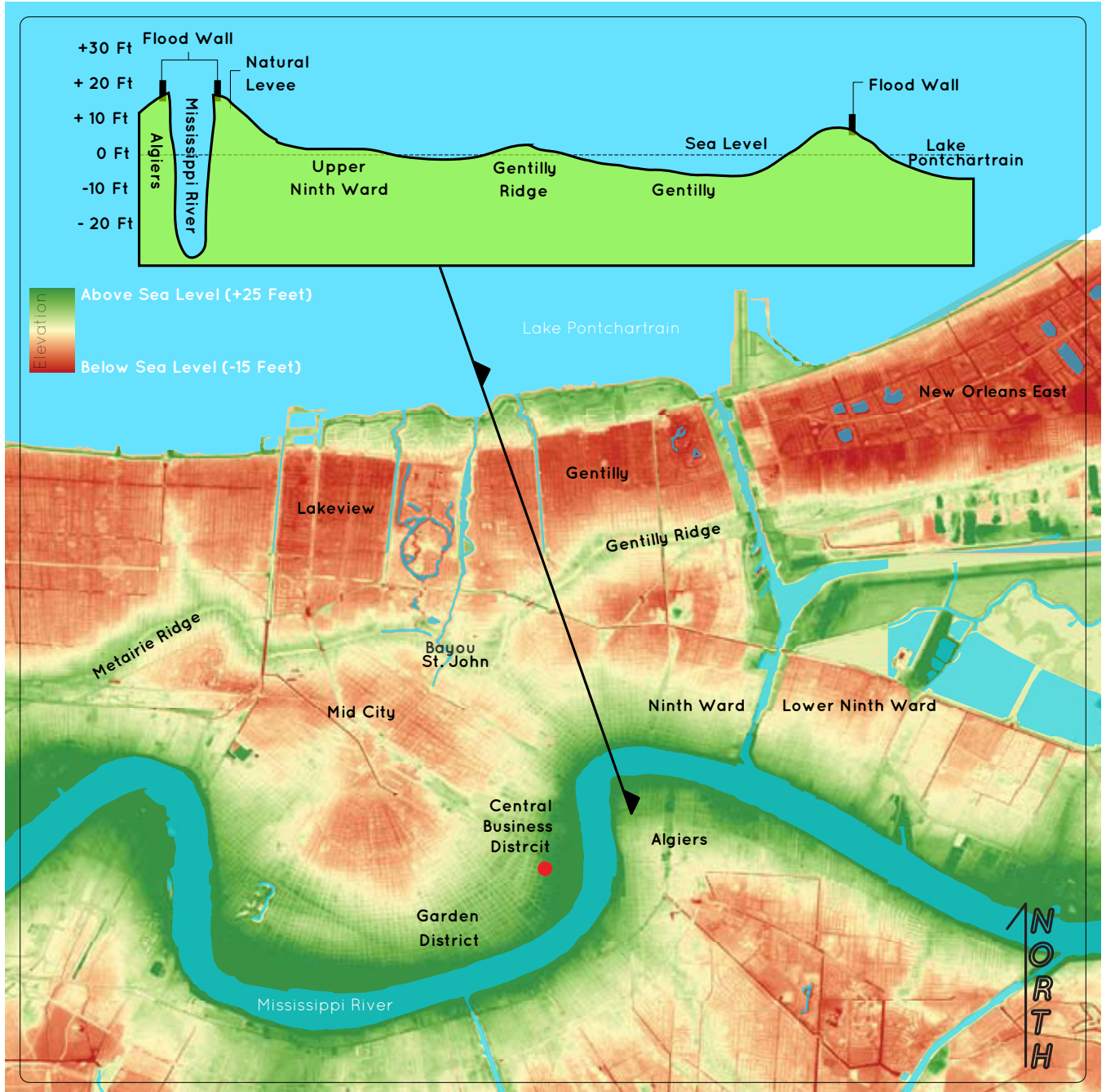
Establish the proposed economic development public-private partnership (PPP) with a diverse and representative board and a set of working groups focused on existing, emerging and potential sectors and on workforce development.

A

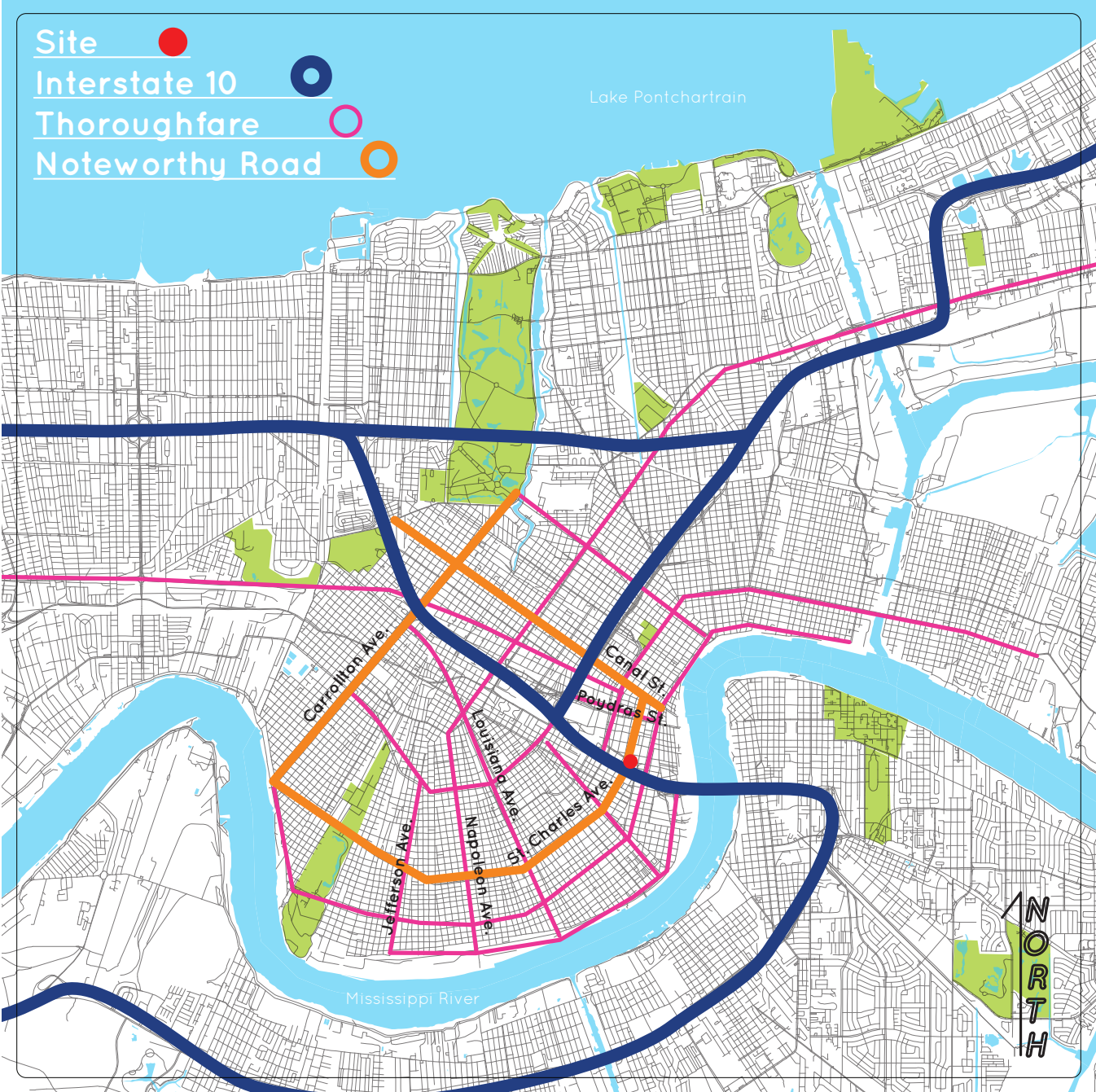


LEE CIRCLE / NEW ORLEANS / LOUISIANA

Mapping



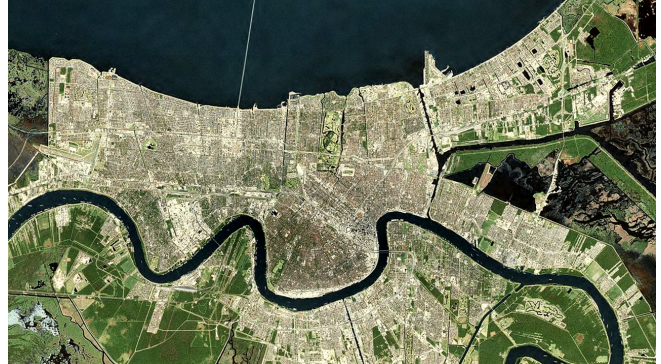
Mapping

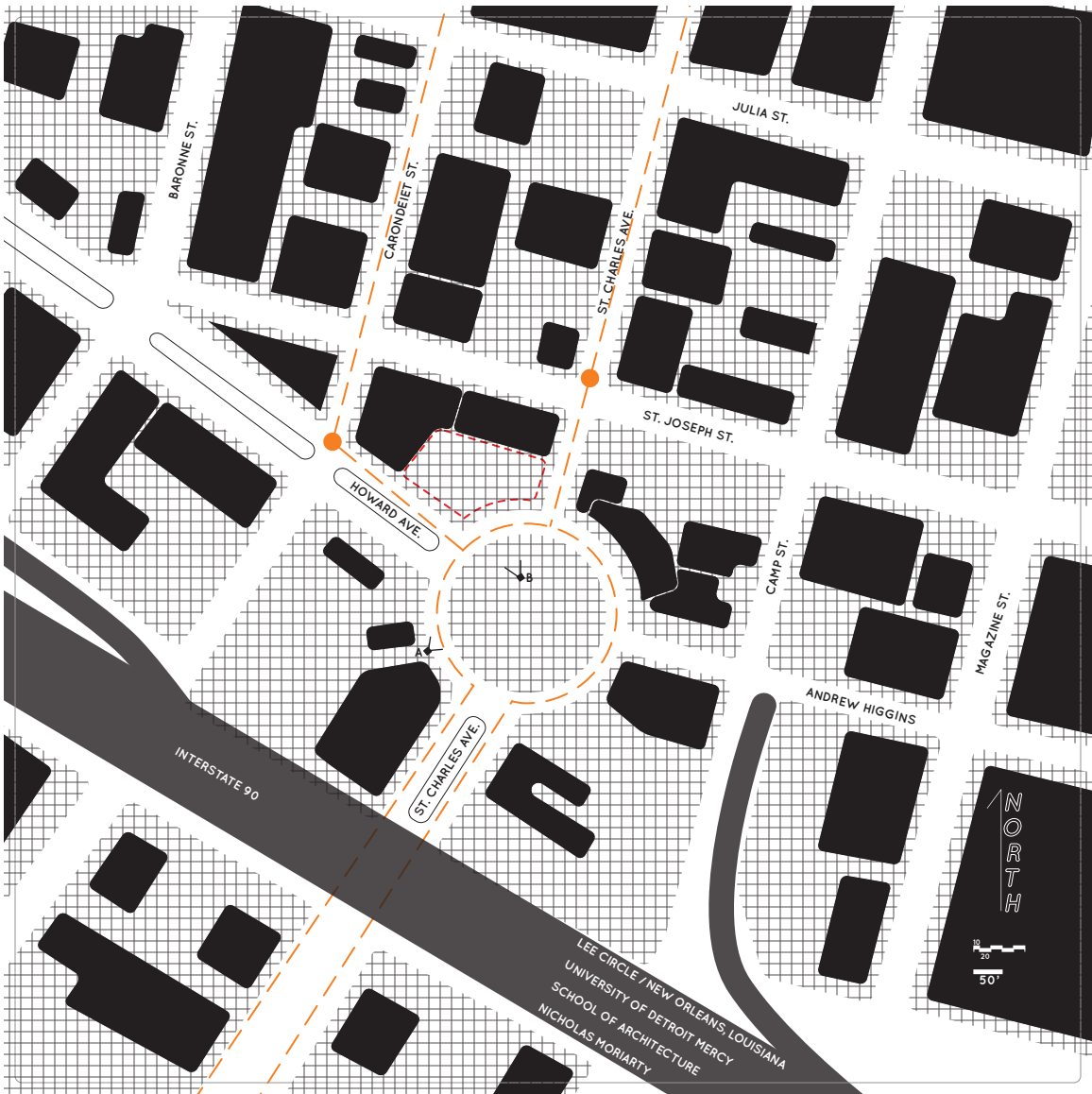




ARC Movie

<http://vimeo.com/11360946>

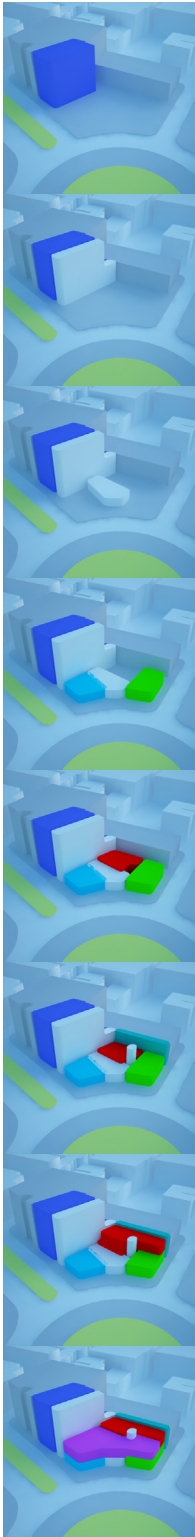
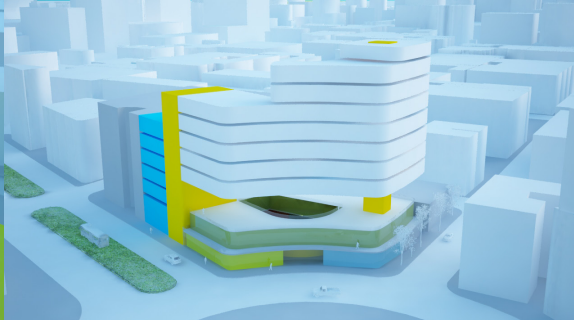
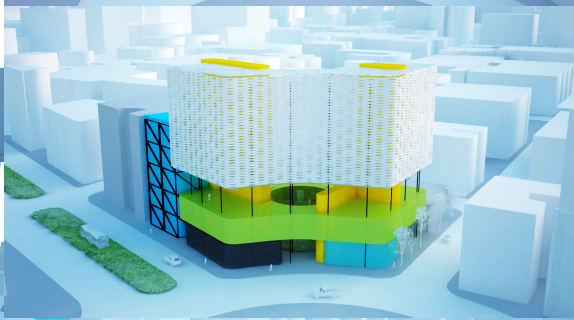
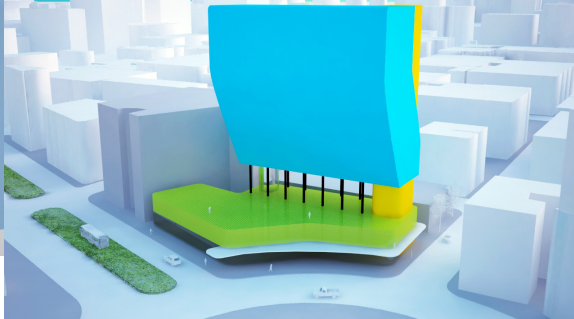
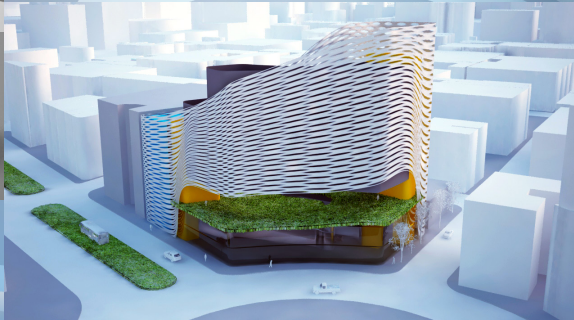
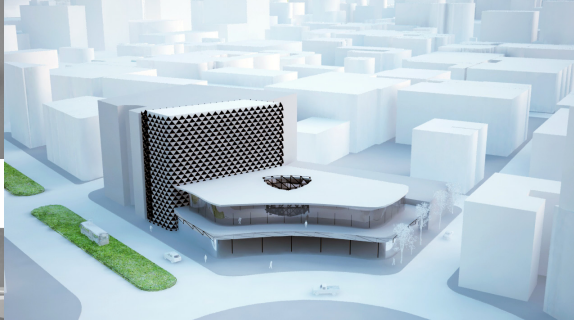
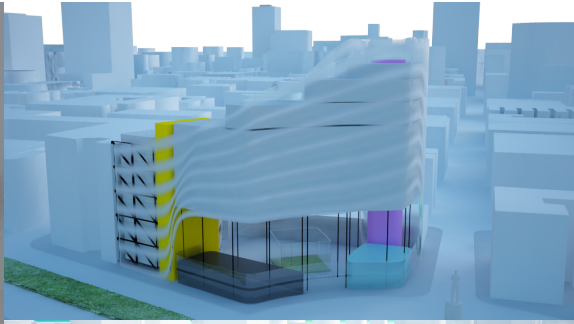
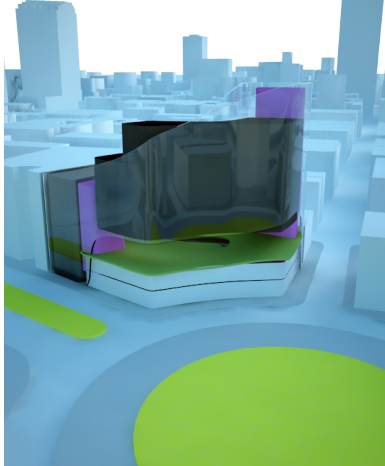
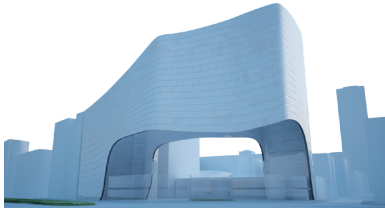
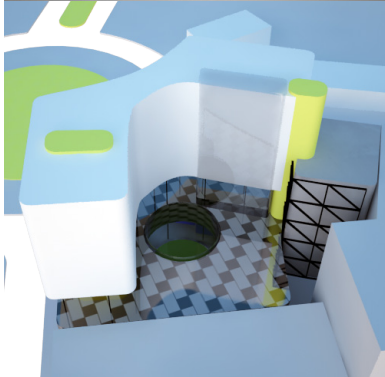
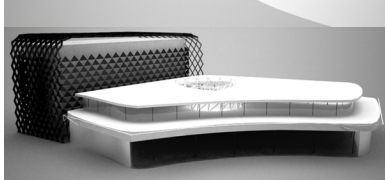
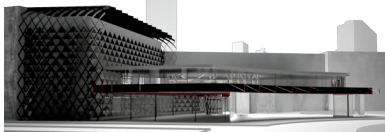
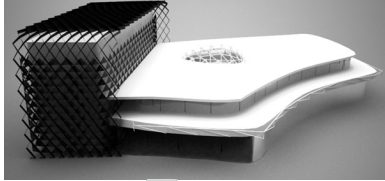
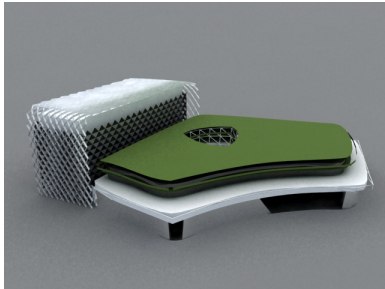


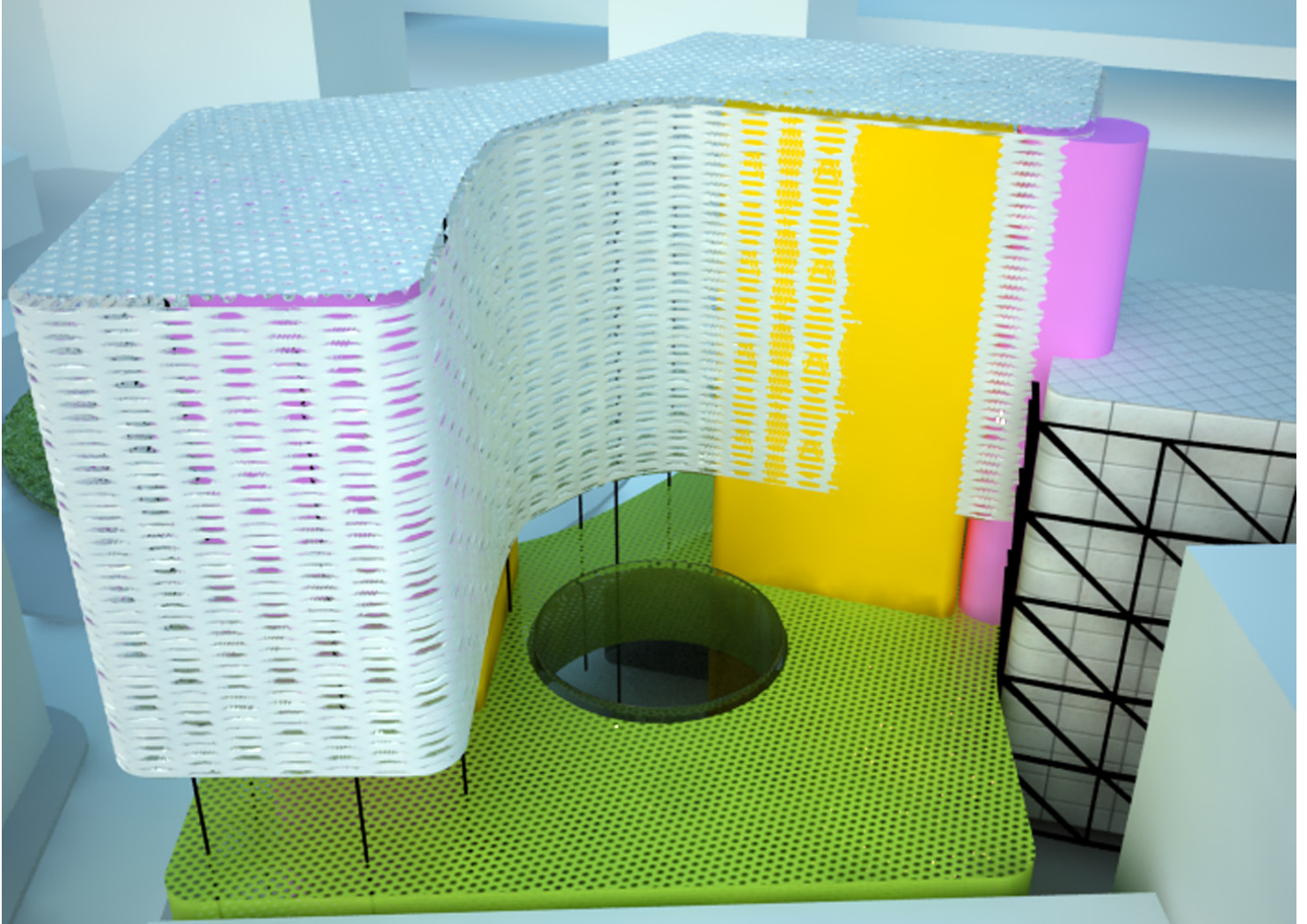


Site Plan

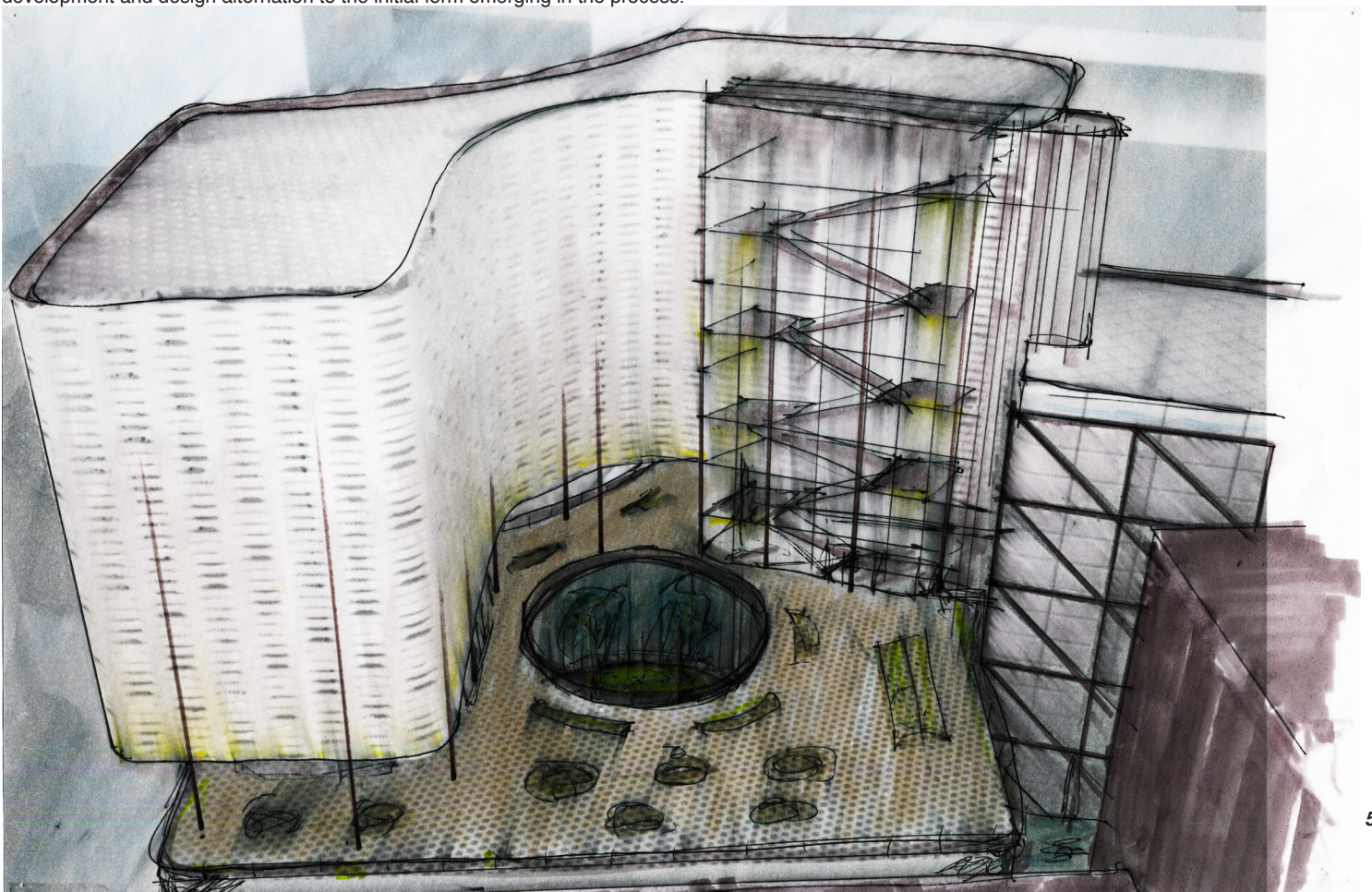
Aerial Perspective

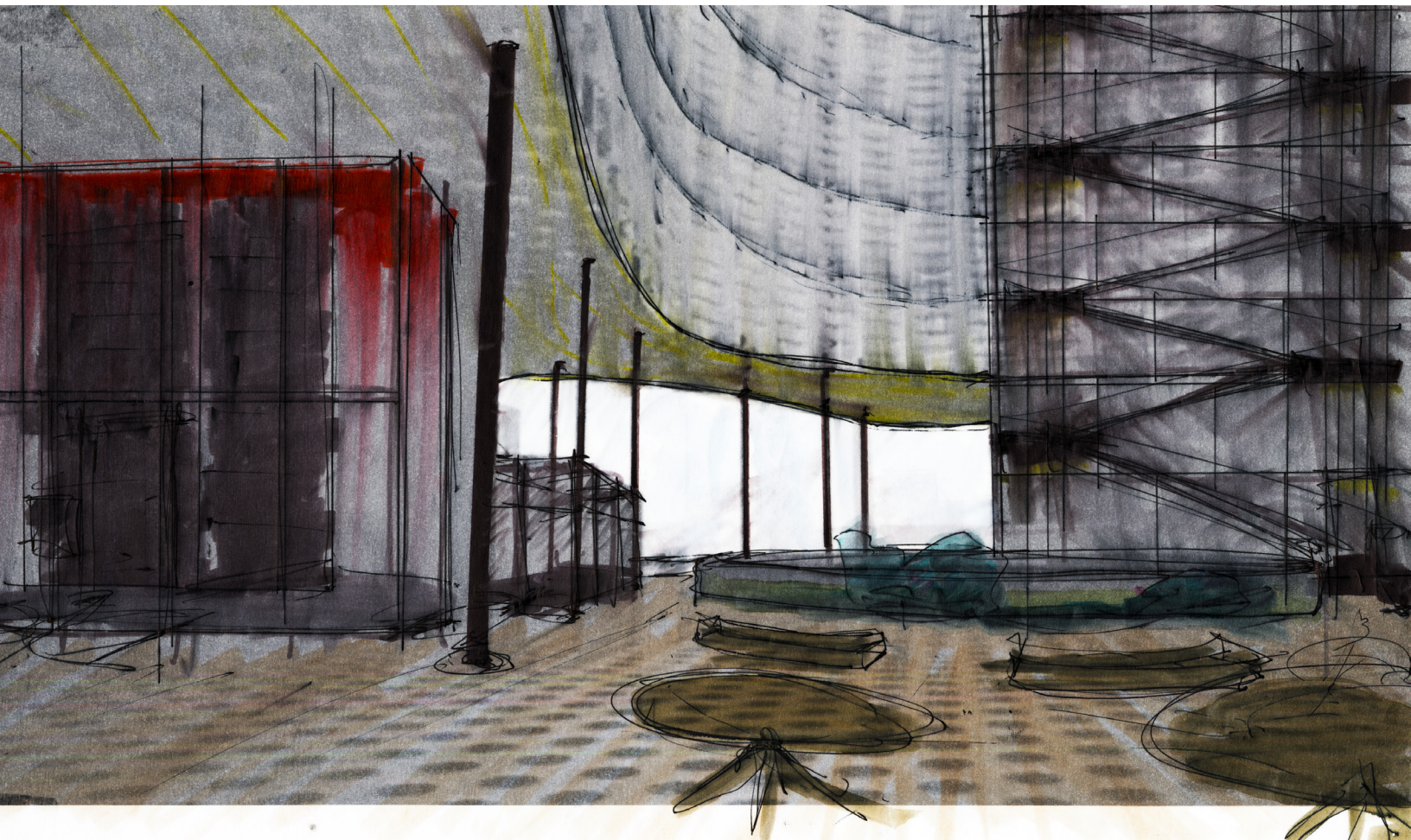
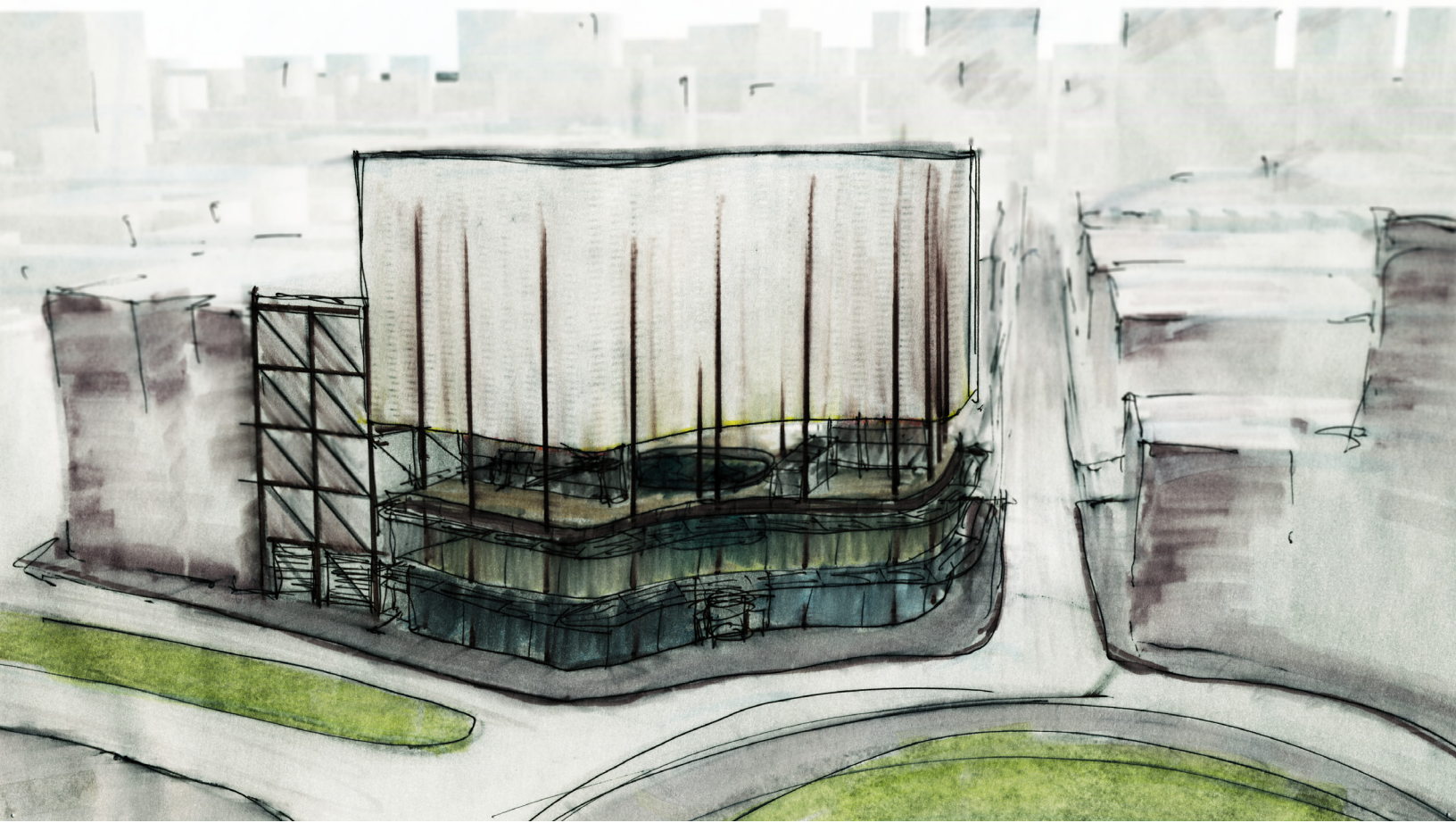


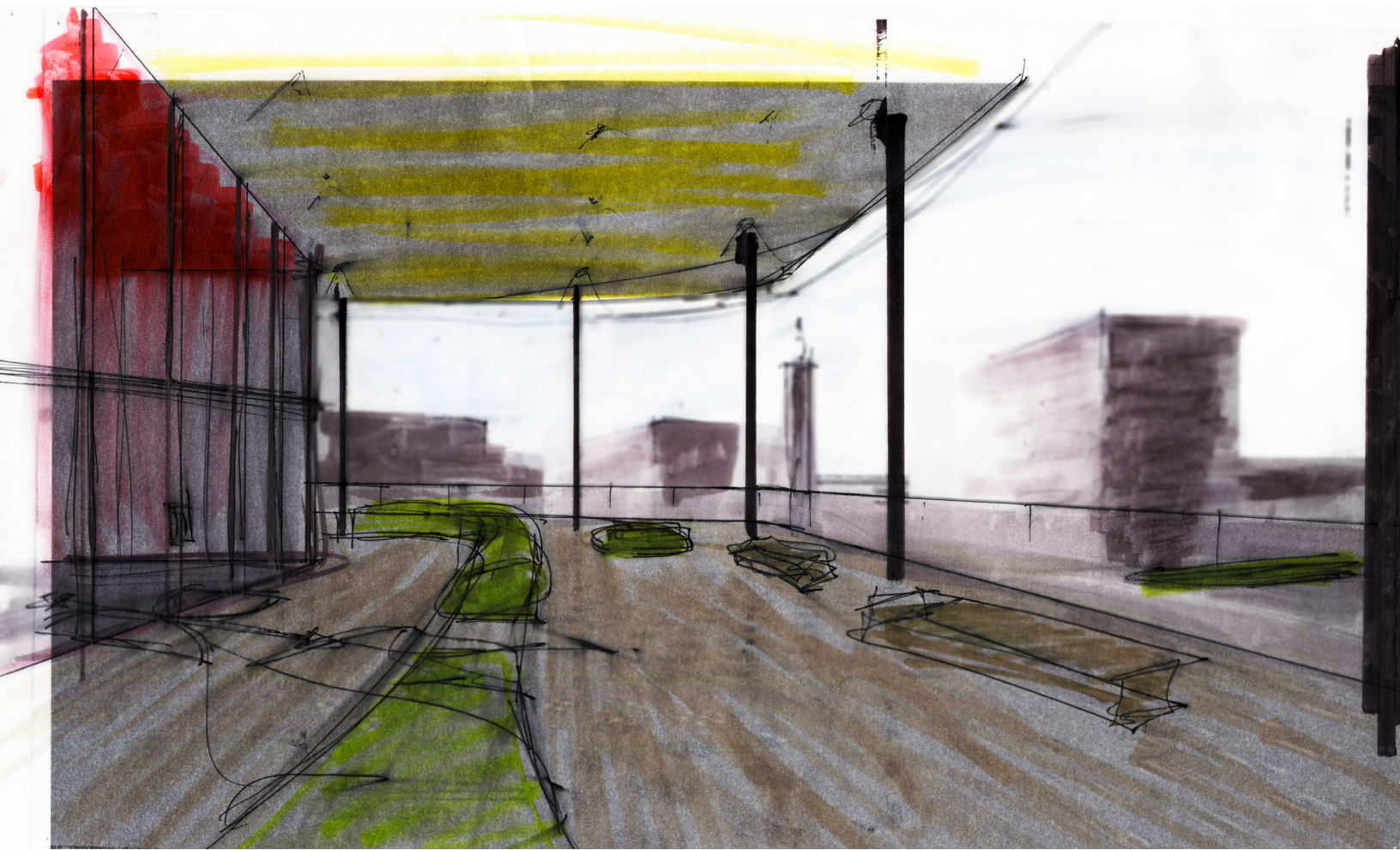




These drawings are working with digital representation as a framework for future hand creative work and understanding the intellectual value of drawing as a means to knowledge. These drawing experimenting with the looping cycle of representation medium through scanners, printers, software, and rulers. Rather relying on a single technique, rapidly computer-generated renderings are overdrawn by hand, with detailed development and design alternation to the initial form emerging in the process.

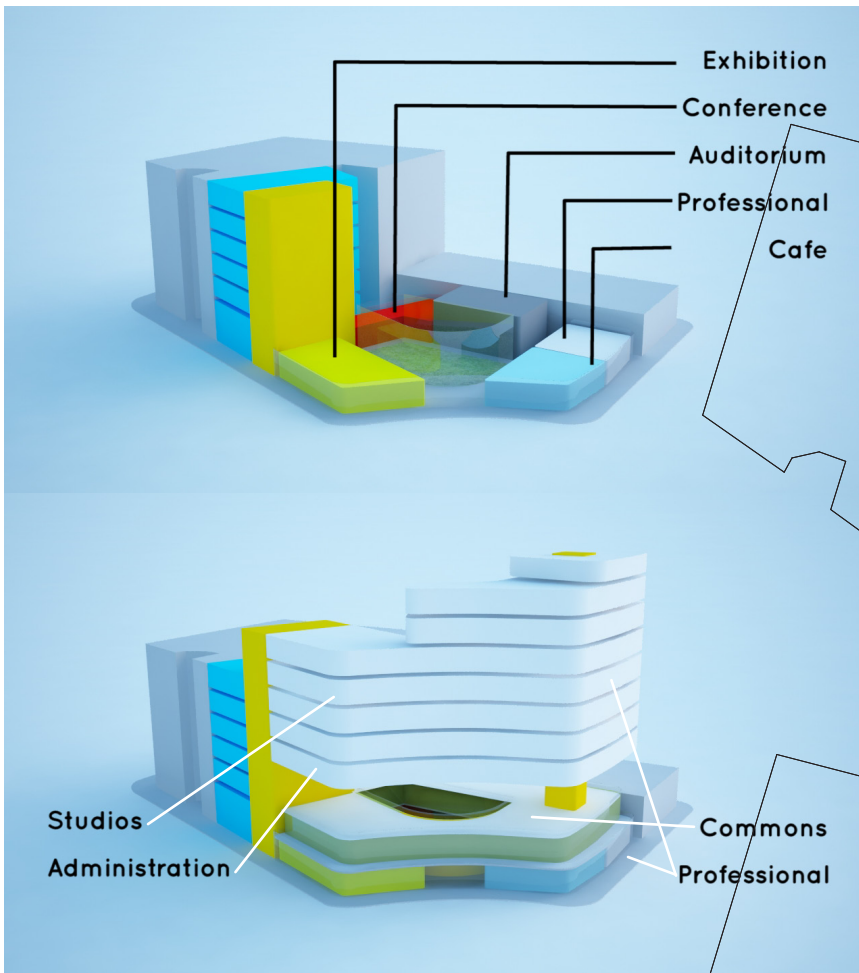
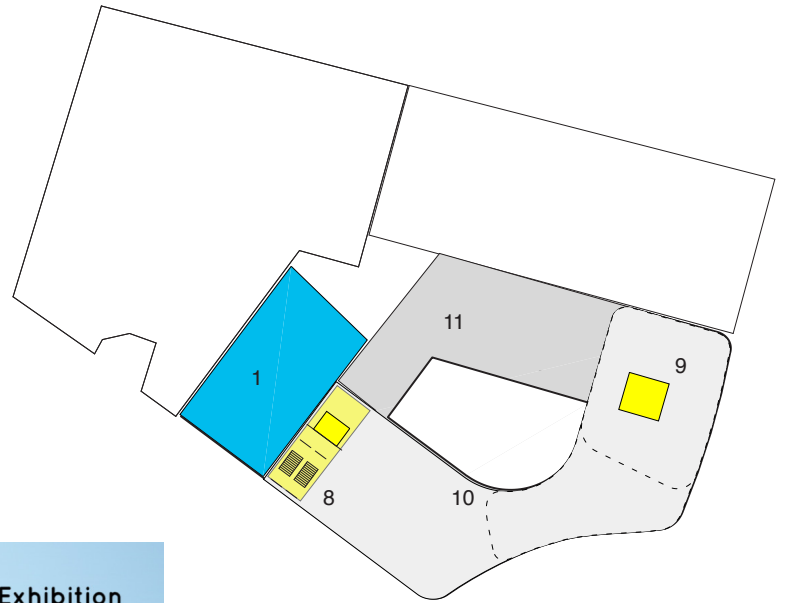






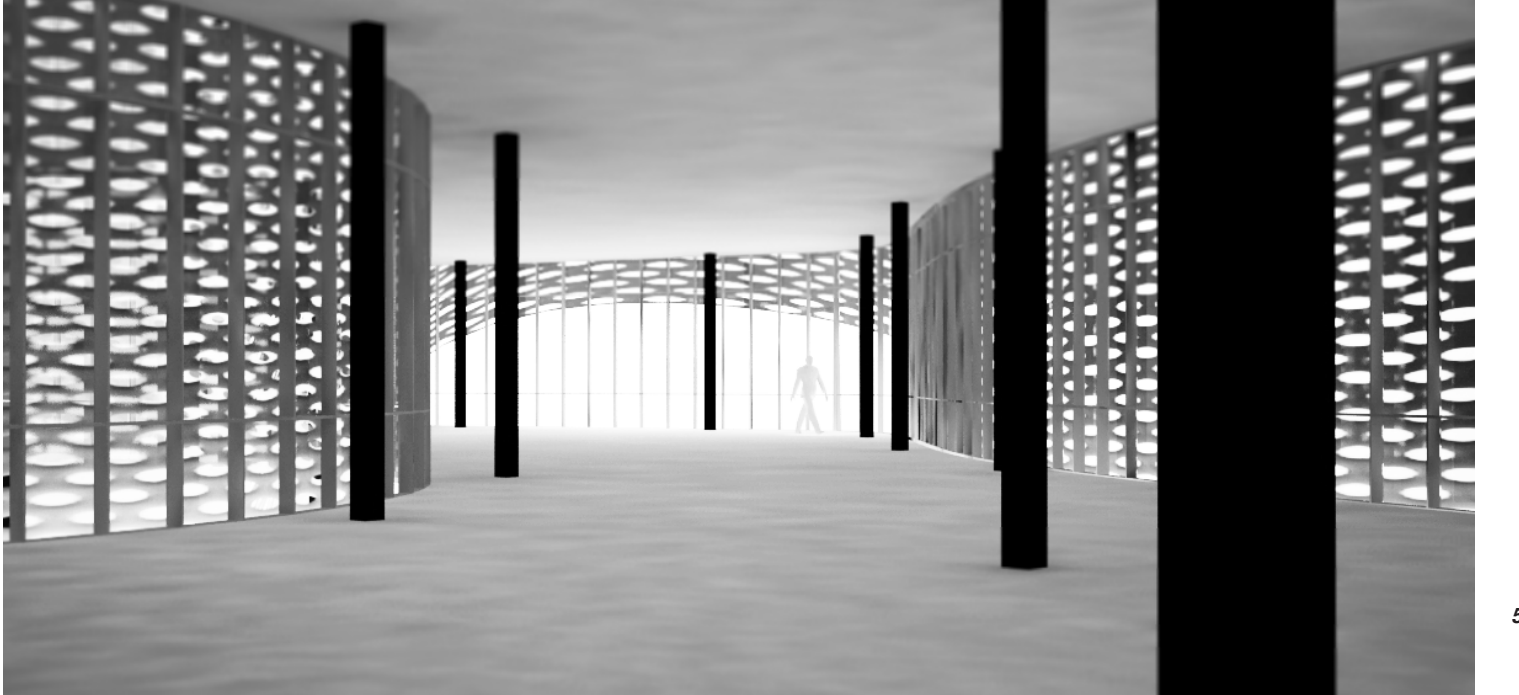
Planning

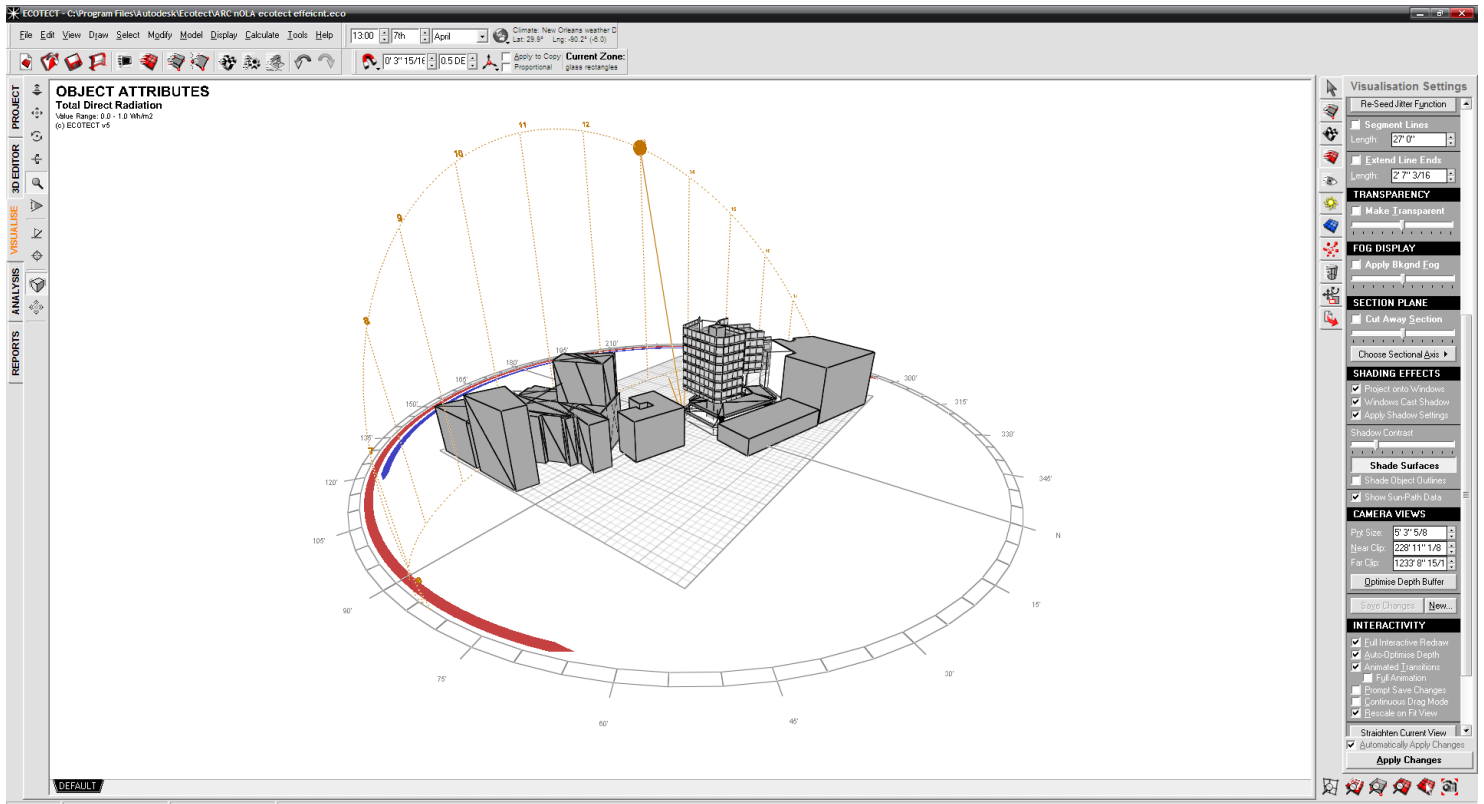
1. Labs
2. Library
3. Exhibition
4. Cafe
5. Professional Entrance
6. Auditorium
7. Conference
8. Administration
9. Professional Office
10. Studios
11. Public Space
12. Courtyard





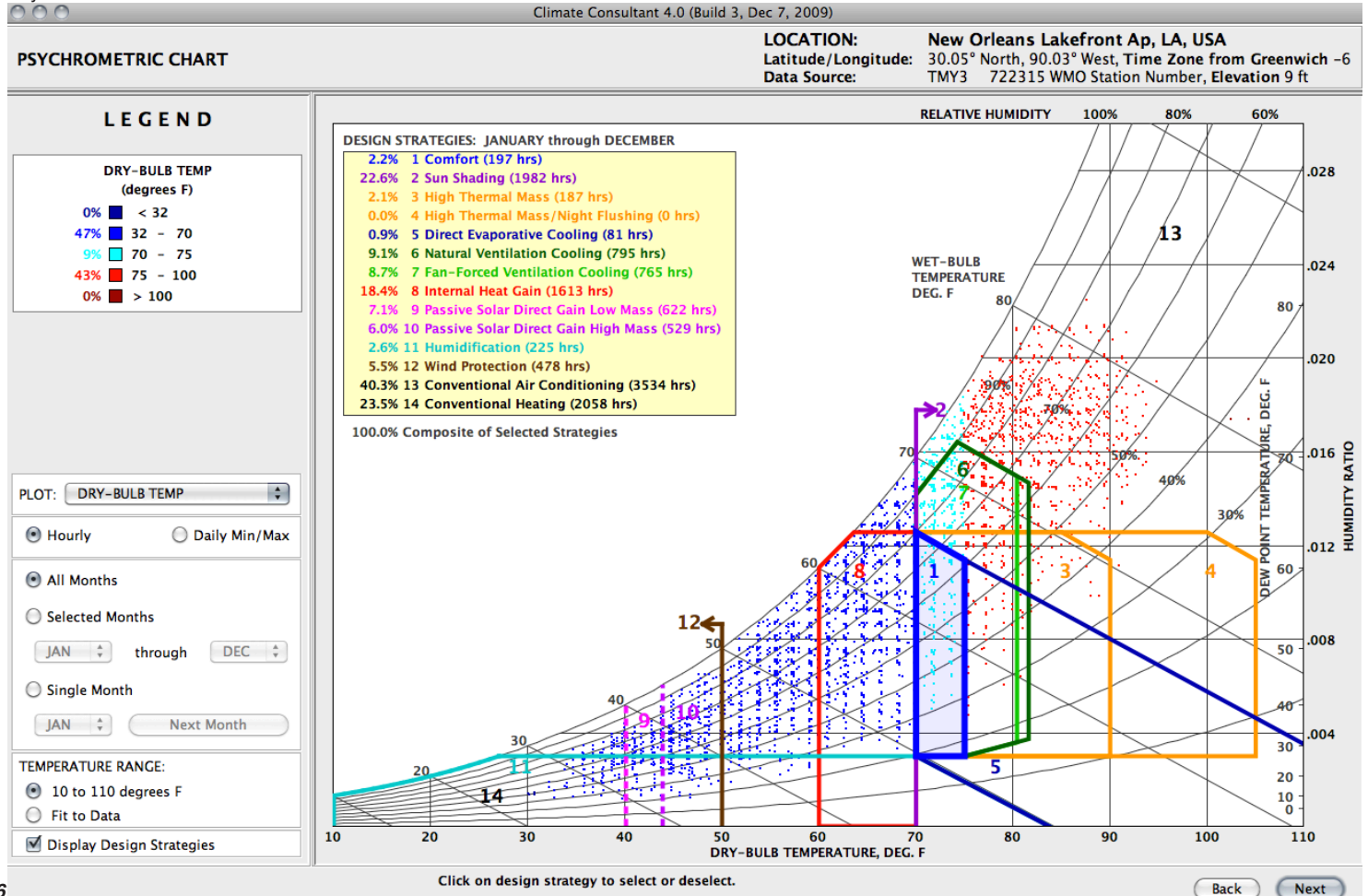
Interior Perspective



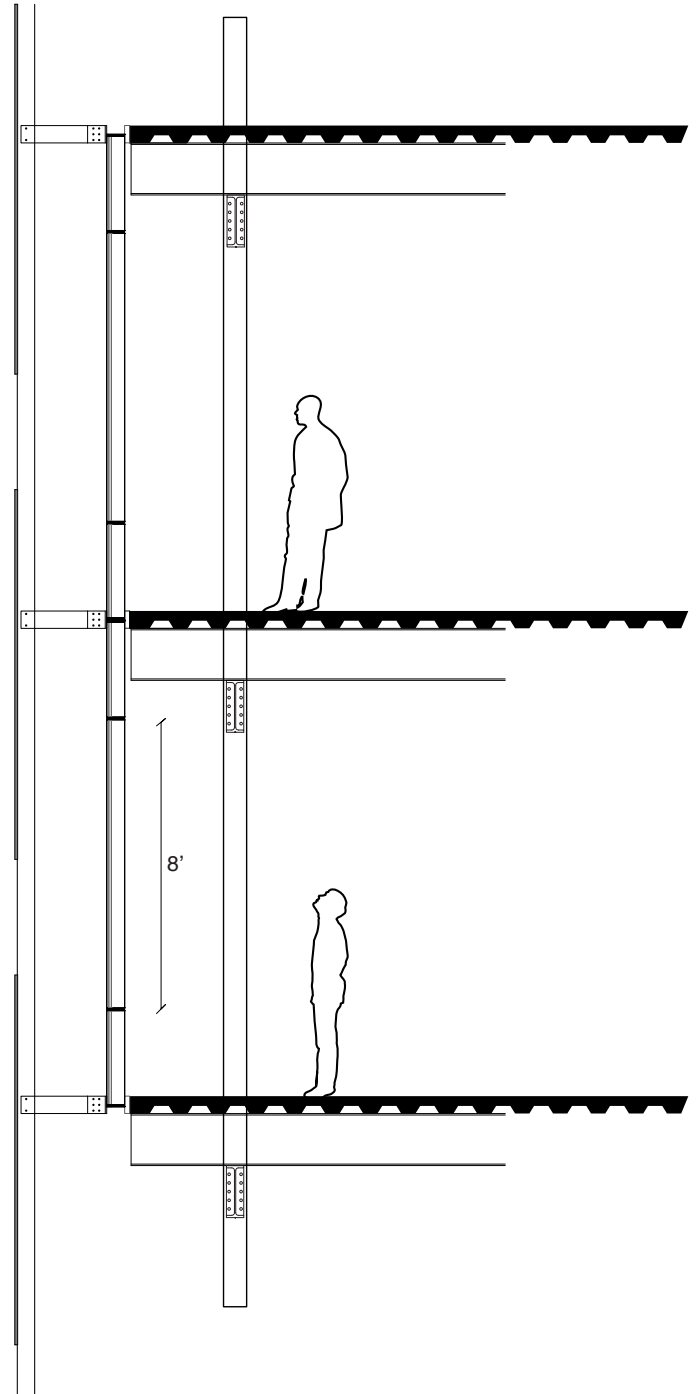


Ecotect Analysis

Psychrometric Chart

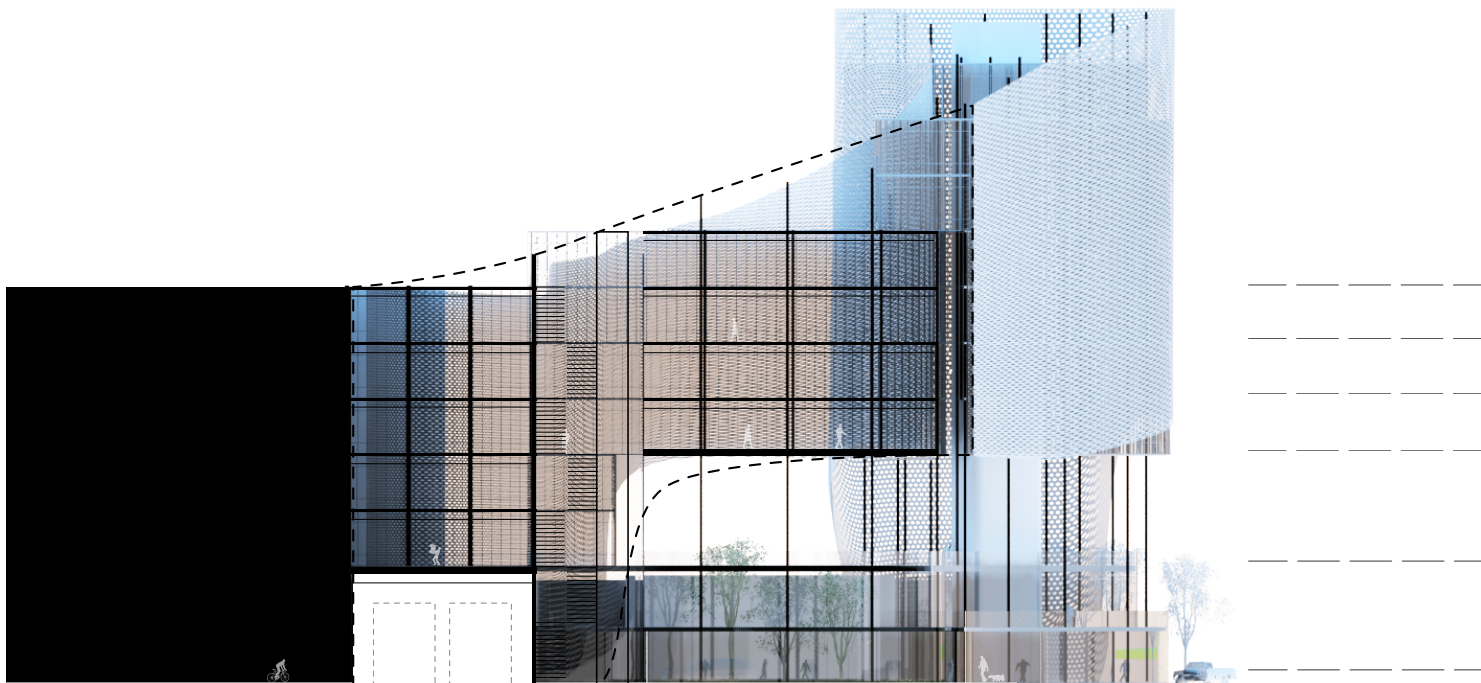


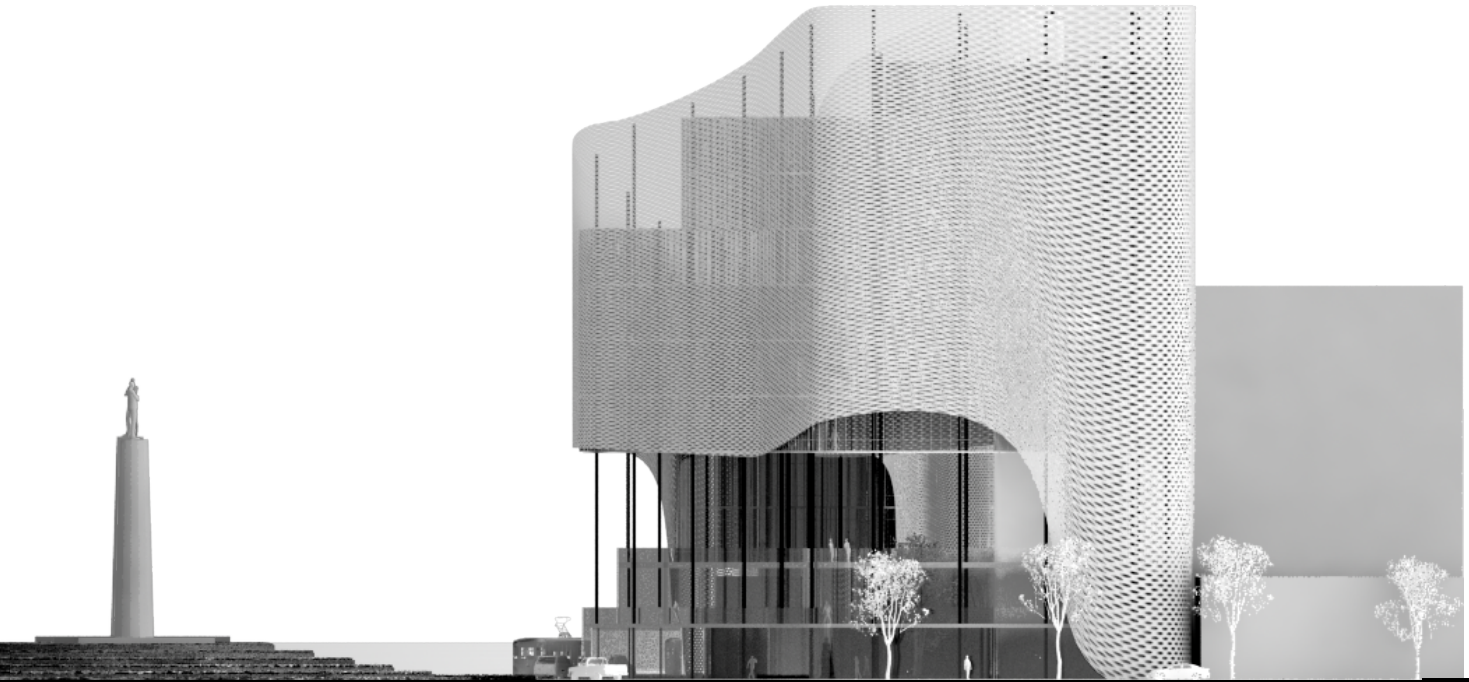
Floor Section



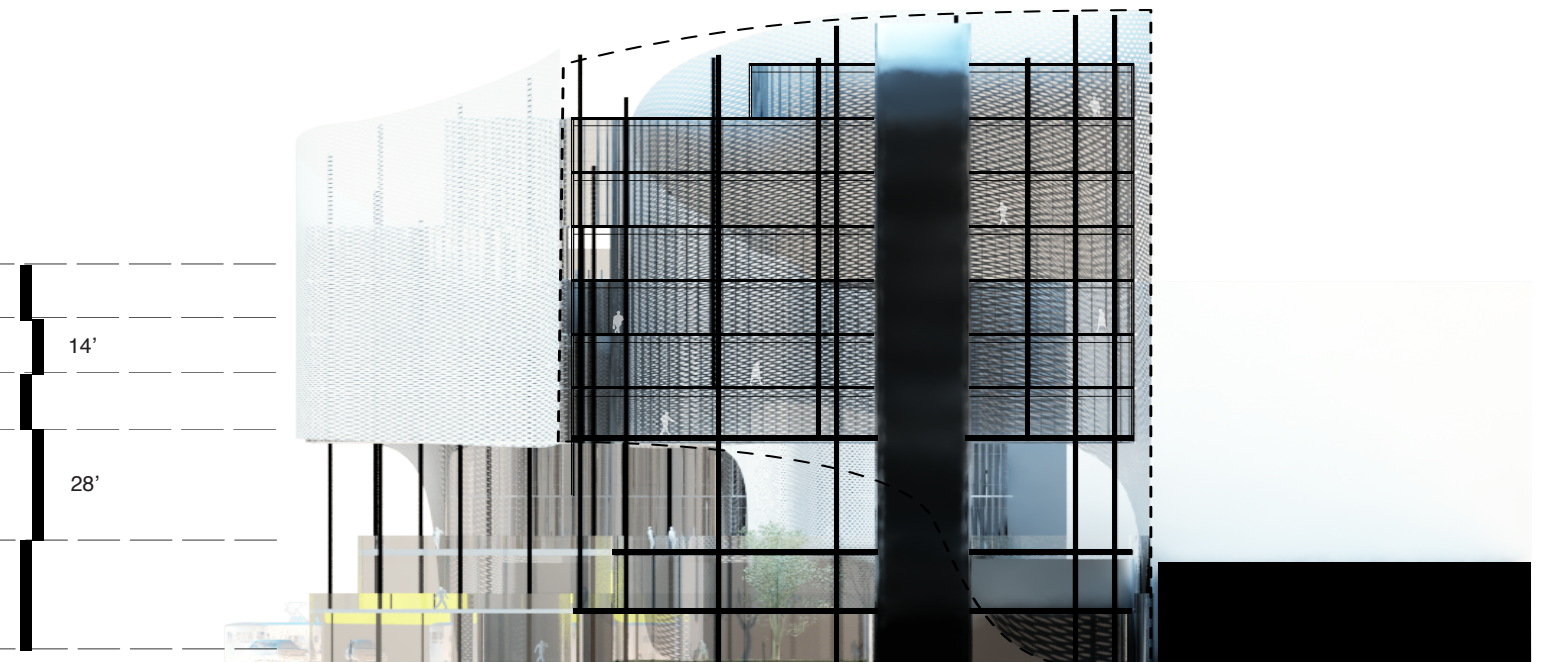


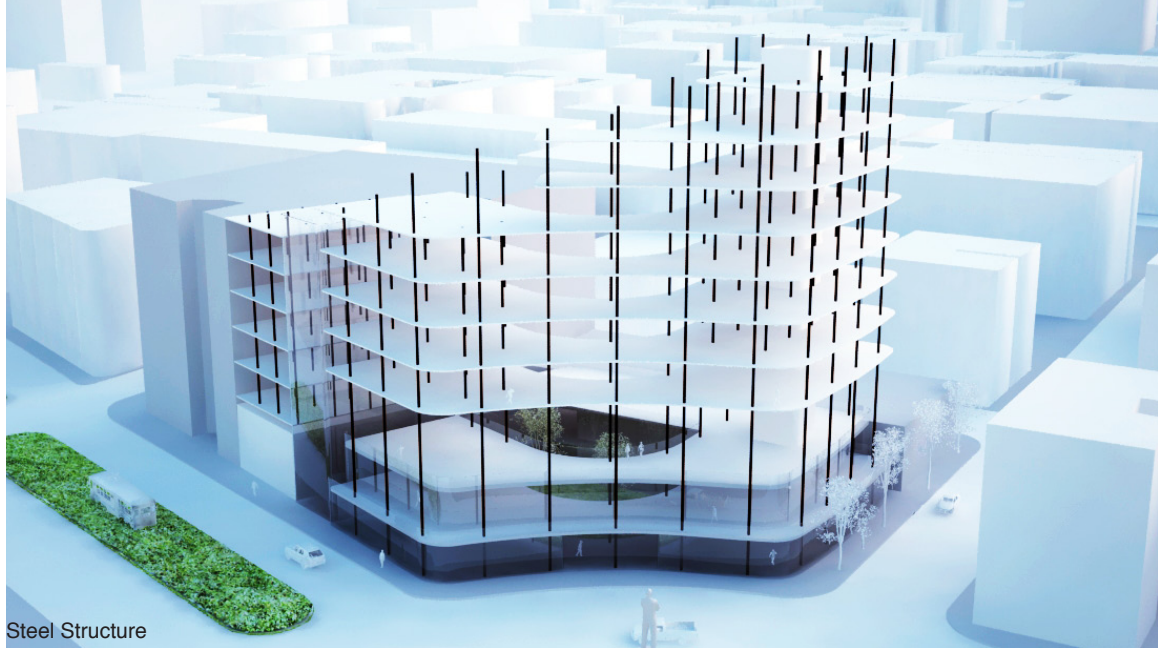
Elevation 1



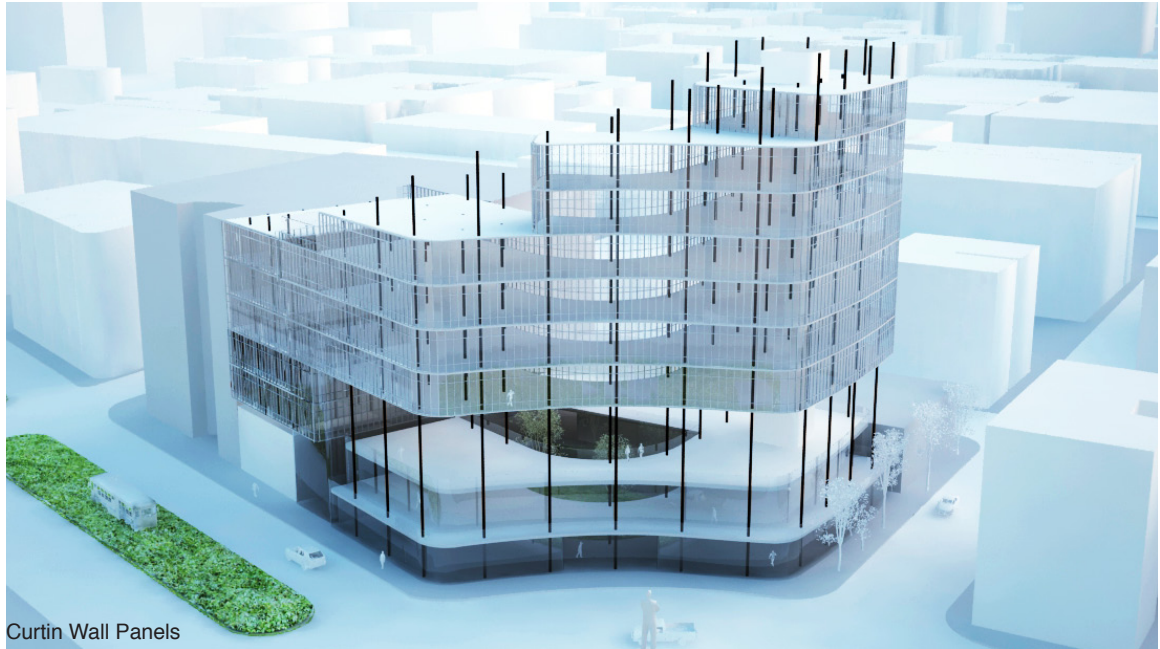


Elevation 2

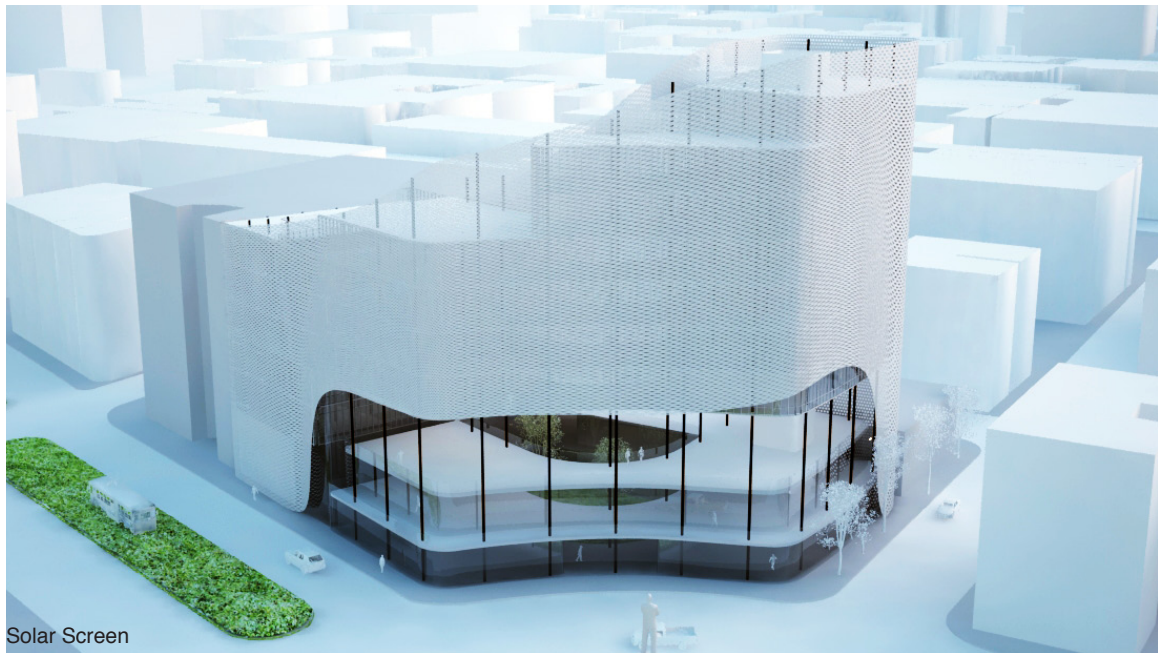




Steel Structure



Curtain Wall Panels



Solar Screen



Perspective @ Noon

Perspective @ Dusk



Conclusion

Tool:

- *A device or implement, esp. one held in the hand, used to carry out a particular function*
- *A piece of software that carries out a particular function, typically creating or modifying another program.*

Software - The programs and other operating information used by a computer

Middleware - Software that occupies a position in a hierarchy between the operating system and the applications, whose task is to ensure that software from a variety of sources will work together correctly. Its role is to make application development easier, by providing common programming abstractions, by masking the heterogeneity and the distribution of the underlying hardware and operating systems, and by hiding low-level programming details.

Hardware - Tools, machinery, and other durable equipment — The machines, wiring, and other physical components of a computer or other electronic system.

The opportunities that digital mediums have are limitless. With architecture schools transitioning to digital means and methodologies these questions posed are currently being challenged. The most successful examples will be hybrid processes using a looping cycle between analog and digital products. Generative strategies have production speed as one of the assets, but this speed must be properly curated.

Resources

- Digital Materiality in Architecture. Baden: Lars Müller, 2008. Print.
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<http://www.contextfreeart.org/>
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<http://www.grasshopper3d.com/>
<http://www.mos-office.net>
<http://www.Opentopography.org>
<http://processing.org>
<http://structuresynth.sourceforge.net/>
<http://www.subblue.com/blog/2008/5/26/simple-attractors>
<http://www.subblue.com/projects/guilloche>
<http://www.syedrezaali.com/blog/>
<http://www.unfold.be/pages/projects/items/3d-printer>

GSD

FALL 2009

1311: Mediums

Department of Architecture

Michael Meredith

Course Description

Are you tired of ____ ?

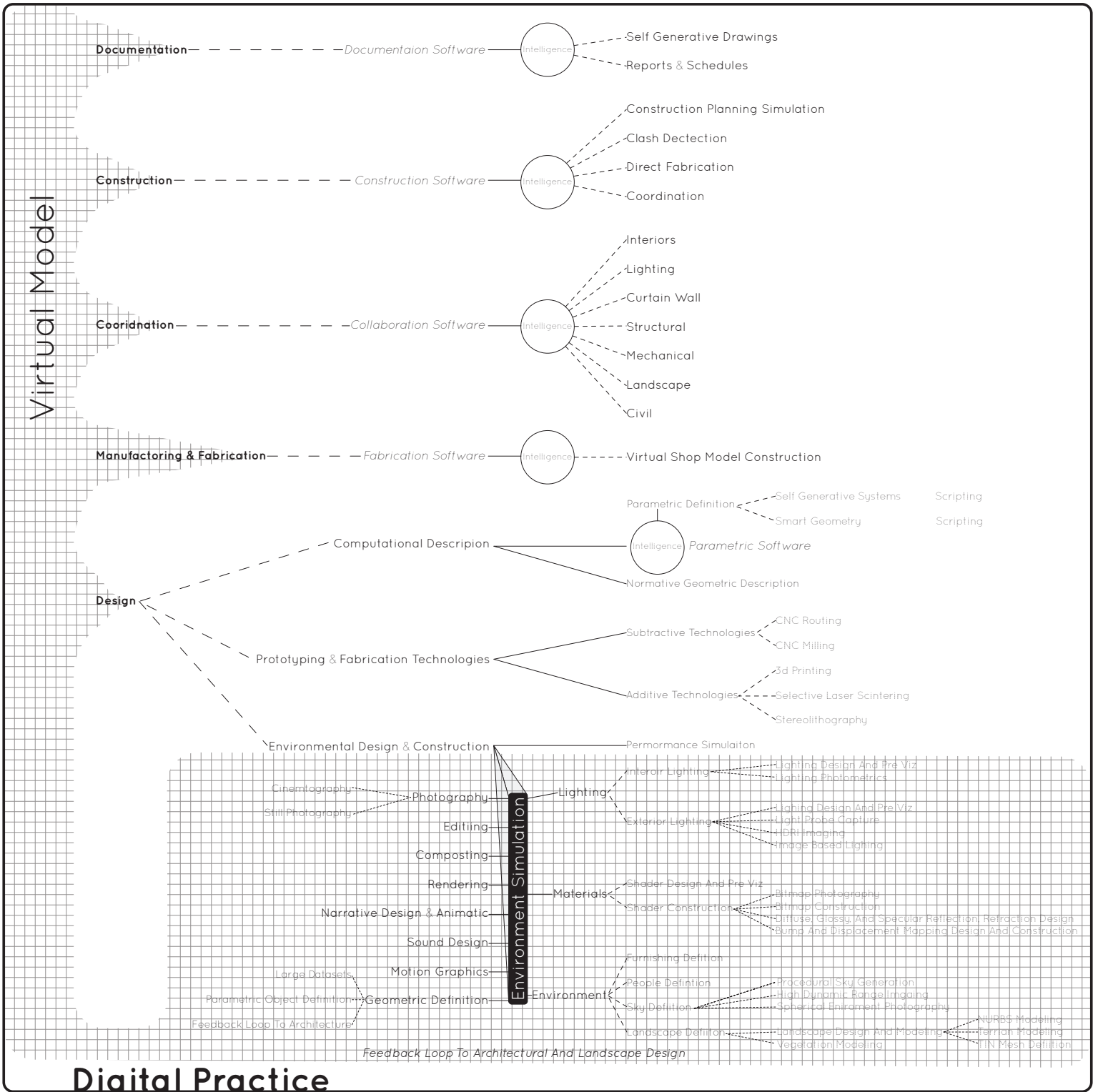
If you answered yes to this question, keep reading.

It could be said that avant-garde production works according to this formula: Medium (technical support) + Convention (artistic genre, typology, history) + Play (improvisation, !@#?) = Architecture. Once you have filtered the history of architecture through this formula, however, it becomes clear that these variables are in constant turmoil. While Convention is perhaps fairly resistant to the anxiety and whimsy of change (though not impervious), Medium remains consistently problematic and has often, especially in recent years, instigated and exacerbated Play. We will be investigating the problems inherent in this understanding of medium and working towards the possibilities of a post-medium condition for architecture.

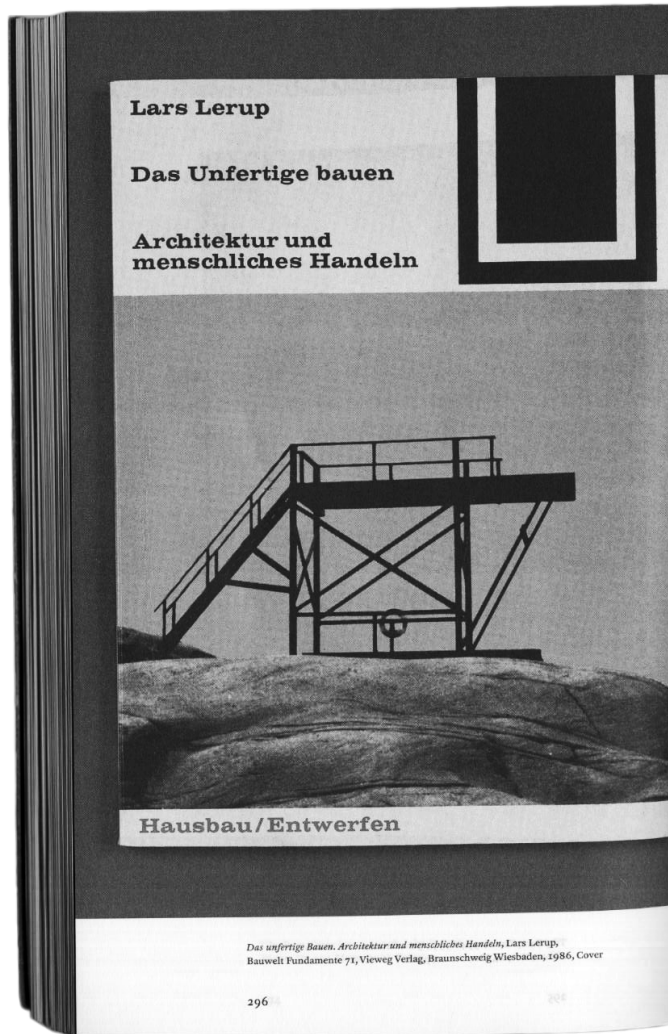
Architecture still operates for the most part according to the modernist criteria of medium specificity (see Clement Greenberg and Colin Rowe). The notion of medium specificity tells that the work (of art) is successful if it fulfills the promise of the medium used to create that work of art. Currently, there is no shortage of specific mediums for architects to work with: Space or Image or Geometry or Typology or Program or Materiality or Narrative or Figuration or Digital Representation or Algorithms or Digital Fabrication or Experience or Structure or Environmental Systems or Tectonic Expression or Politics, etc. Embedded within each of these instantiations of medium specificity is a specific subjectivity. Armed with these subjectivities, architects see the constraints of Convention and the possibilities for Play refracted and distorted through the specifics of Medium. History, then, can become a geometric problem or a material problem or a programmatic problem, etc. Within this medium subjectivity there develops a symbolic specificity: people who share the same subjectivities, with increasing narrowness, can understand and read the nuanced signifiers and symbols of that medium. Although medium specificity is no longer a dominant idea, architectural discourse has been left with its remnants the narrowness and specificity of continually splintering regimes in its current state of disarray.

As architects (especially students) operating today, we do not build the thing we are designing. The act of architecture is fundamentally mediated. This lack of a clear self-image is where architecture is both empowered and weakened. For better or worse, the problem of medium is tied to the problems of representation and methodology the problem of the blank page, or how to begin. Once you pick your medium, these problems of representation and methodology how you are going to work rely upon an associated discourse and set of referents (Convention) with their own politics and history.

Practice



Sturm der Ruhe



The opening exhibition at the new Architekturzentrum Wien, in the Museums Quartier, has a deliberately programmatic message. An institution that is dedicated to the mediation and propagation of architecture has to question these very mechanisms at a time when it is repositioning itself. Architecture exhibitions always tend to present documentation and allude to existing buildings. This capability to represent the permanently absent is treated thematically in *Sturm der Ruhe*. What is architecture? and new possibilities for mediation are sought.

Why "Sturm der Ruhe - What is architecture?"

"Work on the theme for this opening exhibition has been very intense, and we initially started out by doing research into contemporary minimalism. Not just in architecture, but also in the visual arts and lifestyles. The issue was not, however, either one of form or style, but why these kinds of reduced spaces exercise so much fascination. This led to the question of the perception and the spatial experience as the spectacular, even the minimalist spectacular, often do not permit an experience beyond the moment of astonishment. The mediation of architecture lies like a waterproof foil over the objects concerned. The market demands sensations and asks no further for actual qualities. So we wanted to create an awareness of architectural qualities in and around the unspectacular. Hence the title: *Sturm der Ruhe*'

(Note: the German translated as a 'storm of tranquility'.)"

-Dietmar M. Steiner

The subject matter of the exhibition is situations and buildings that do not reveal any architectural intention to the layperson. They are apparently and genuinely casual solutions that nevertheless generate moods and an atmosphere. The nothing is not merely nothing - the personal and physical experiences of new architecture develop from scratch in terms of their utilisation in the media. Projects that appear cool and smooth in most publications open up entirely new sensual parameters when viewed differently. The visitor should be able to experience the abstract architectural facets such as the mood, the atmosphere, the smell, awareness, the traces of usage or the space's tactile qualities. In the exhibition thirty such situations are being presented in different forms.

Glossary of Terms

Additive Fabrication- Manufacturing products by building them one tiny layer at a time Manufacturing products by building them one tiny layer at a time

Aerial LIDAR- (Light Detection And Ranging) is a method of obtaining 3-dimensional data for the creation of a Digital Terrain Model.

Attractors- Mathematics; within grasshopper it allows you to set multiple 'attractors' which interact realistically just like electric charges, magnets, heat flows or fluids. Sliders control whether each point is a source, sink, vortex or a combination of these. There can be many other geometrical sets that are attractors. When these sets are hard to describe, then the attractor is a strange attractor.

Ben Fry / The Preservation of Favoured Traces- (<http://benfry.com/traces/>) A simpler version of a larger effort that looks at the changes between editions, and is intended as the first in a series looking at how the book evolved over time. Built with Processing.
Climate Consultant 4 - Graphically displays climate data in either metric or imperial units in dozens of ways useful to architects including monthly bar charts, timetable charts, and psychrometric charts, sun shading charts, and sun dial charts.

Context Free- a program that generates images from written instructions called a grammar. The program follows the instructions in a few seconds to create images that can contain millions of shapes.

David Pye- Professor of Furniture Design at The Royal College of Art from 1948-1974. Develped concept of "the workmanship of risk". The Nature of Art and Workmanship defines what is valuable in terms of workmanship on two levels: the workmanship of risk, meaning a quality of work dependent on the judgment, dexterity and care with which one works, and the workmanship of certainty, which involves predetermined results before a thing is made, such as in automated production.

Definition- Grasshopper file format

Ecotect- Sustainable design analysis software

Future of Design Conference- The conference format originated after Dean Monica Ponce de Leon attended a series of closed-door and highly informative design conversations. The pervasive sharing of the conference content is a response to the lack of insightful design conversation that is available and occurring in public discourse and spaces.

Grasshopper- For designers who are exploring new shapes using generative algorithms, Grasshopper is a graphical algorithm editor tightly integrated with Rhino's 3-D modeling tools.

Gramazio & Kohler - Conceive spatial relationships and contextual behavior through programming. In doing so, we use the potentials of the computer and of digital fabrication complementary to traditional design, construction and building methods. The sensual quality of this design culture manifests itself in the novel expression of a Digital Materiality.

Guilloché Pattern Generator- Named after the French engineer "Guillot", who invented a machine "that could scratch fine patterns and designs on metallic surfaces". The machine improved upon the more time-consuming practice of making similar designs by hand, allowing for greater delicacy, precision, and closeness of the line, as well as greater speed.

Open-Source- Describes practices in production and development that promote access to the end product's source materials
Open Topography - The Open Topography Portal is a GEON Project initiative to build an online system that provides integrated access to high-resolution topographic data, web-based processing tools, and enables the user community to share knowledge, experiences and resources.

Point Cloud- A point cloud is a set of vertices in a three-dimensional coordinate system. These vertices are usually defined by X, Y and Z coordinates. Point clouds are most often created by 3D scanners. The point cloud represents the set of points that device has measured.

Processing- an open source programming environment for teaching computational design and sketching interactive media software

RadioHead House of Cards- No cameras or lights were used. Instead two technologies were used to capture 3D images: Geometric Informatics and Velodyne LIDAR. Geometric Informatics scanning systems produce structured light to capture 3D images at close proximity, while a Velodyne Lidar system that uses multiple lasers is used to capture large environments such as landscapes.

Rep Rap- A low cost open source rapid prototyping system that is capable of producing its own parts and can therefore be replicated easily.

Scripting- "Scripts" are distinct from the core code of the application, as they are usually written in a different language and are often created or at least modified by the end-user.

Simple Attractors- A relatively small number of mathematically simple maps and flows are routinely used as examples of low-dimensional chaos.

Solar Decathlon- The U.S. Department of Energy Solar Decathlon challenges 20 collegiate teams to design, build, and operate solar-powered houses that are affordable, energy-efficient, and attractive. The winner of the competition is the team that best blends cost-effectiveness, consumer appeal, and design excellence with optimal energy production and maximum efficiency.

Structures Synth - Structure Synth is a tool for creating 3D structures from a set of user specified rules.

Subtractive Fabrication- The manufacturing of products by machine tools that reduce a solid block of metal or other material by any combination of drilling, turning on a lathe and grinding

Terrestrial LIDAR- By sweeping a laser beam over a scene or object, the laser scanner is able to record millions of 3D points. These X,Y,Z measurements can be imported into CAD or 3D application software and displayed on a computer monitor as a "point cloud" which has photographic qualities portrayed in one-color, gray-scale, false-color or even true color. Since all laser scan points are 3D, the files can be viewed, navigated, measured and analyzed as 3D models.

Venorni diagram - In mathematics, a Voronoi diagram is a special kind of decomposition of a metric space determined by distances to a specified discrete set of objects in the space.

