A4829 - XIM: Parametic Massing + Optimization

Instructor: Luc Wilson
Thursdays, 6-8pm, 202 Fayerweather

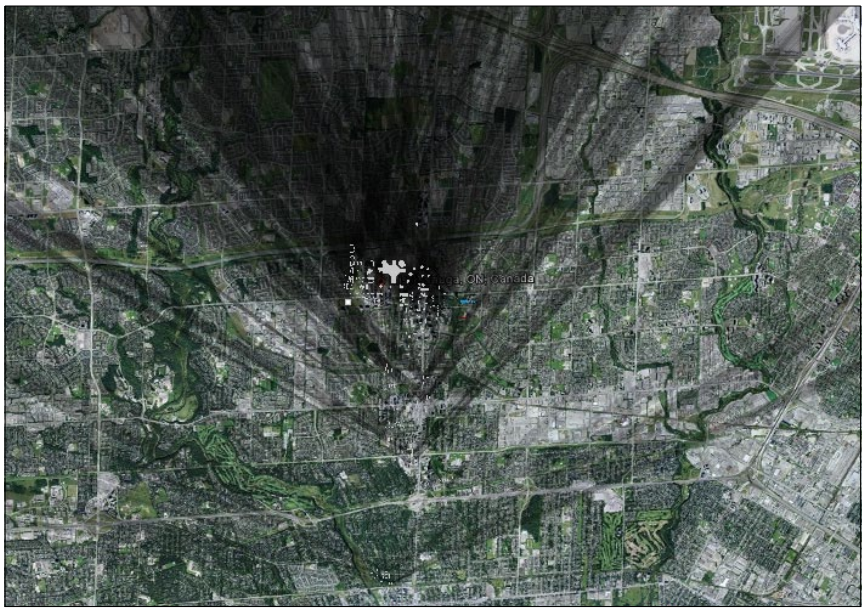
Summary:

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 that will allow for speculation on many possible futures for the city. Using this methodology, termed X-Information Modeling or XIM, students will 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.

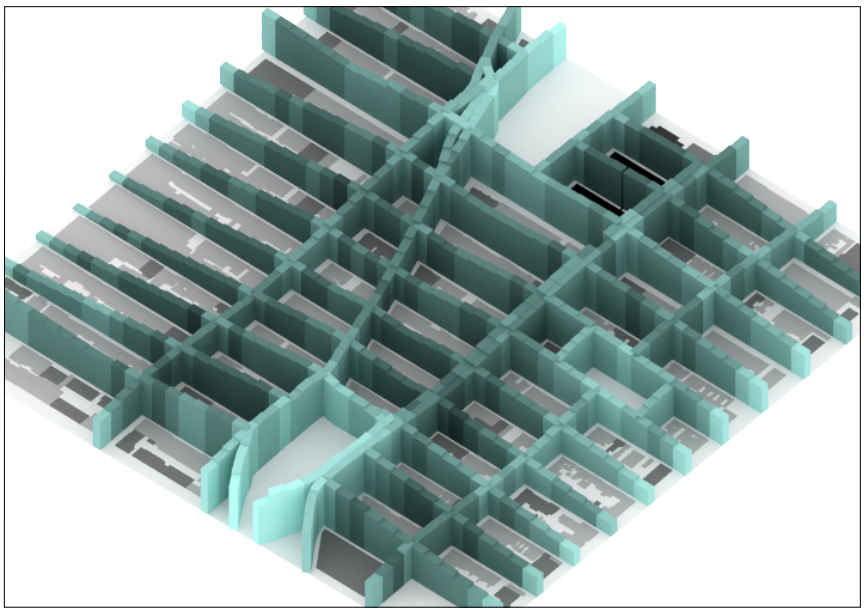
Students will select a site and program, reverse engineering key relationships influencing design and development, such as zoning, real estate value, and the environment, in order to 1) find new relationships between traditionally separate or competing objectives, 2) to visualize speculative futures of the site, and 3) reposition and reorganize those relationships through a visualized evaluation process that challenges design and development preconceptions. Through this process students will be asked to create new drawing types (static and animate) that can effectively communicate the intent of their parametric design systems for evaluation and critique.

Students will learn new tools (Grasshopper, Howl, Excel, Google Earth, Galapagos, etc.), 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 should know Rhino. Grasshopper proficiency is not required, but a basic understand is recommended. Session A is required for Session B, however Session A can be taken with out Session B. Grading for each session will be 30% for attendance and weekly assignments, and 70% for the final project.

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



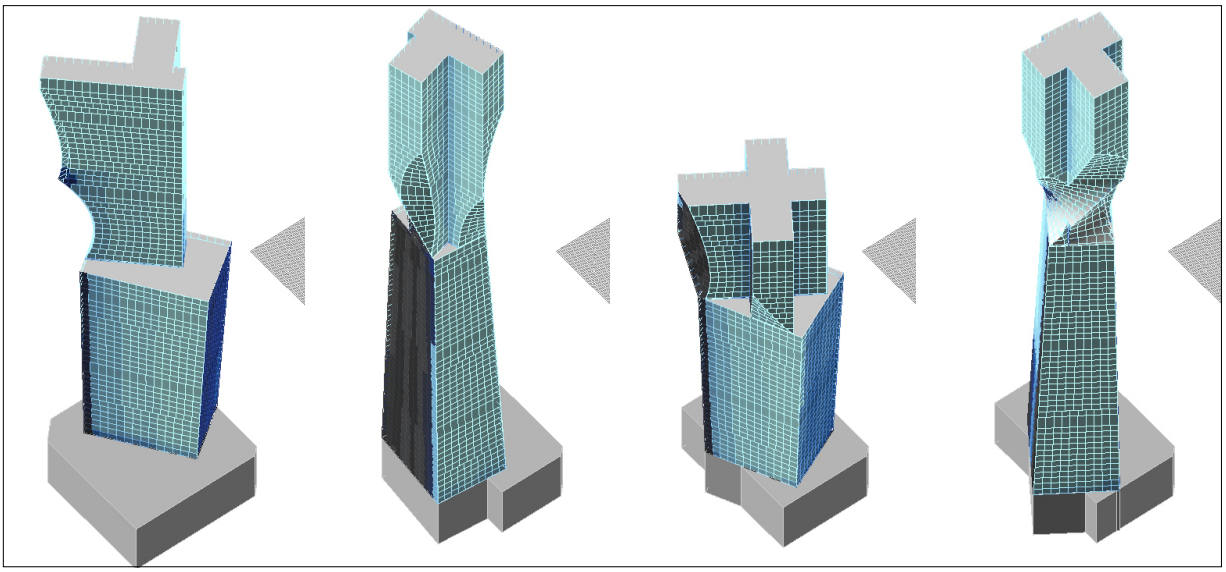
View Analysis



Visualization of walkability, sky exposure, and FAR near Union Square, NY

Session B - Design + Optimization

Session B will be design oriented, with students focused on creating unique parametric massings that will be iterated and tested relative to the evaluation tools created in session A. Based on design intent, students will build a parametric model and through an optimization process, Galapagos in Grasshopper, calibrate their design by testing thousands of design options. Session A will introduce the following grasshopper topics: geometric translation, scaling, solid union/difference, lofting, trimming with curves, and Galapagos. Concepts covered: translating design intent into flexible relationships, spatial requirements of various programs, core requirements, zoning constraints, weighting metrics into a combined score, and scenario based optimization.



Optimization of retail, office, and hotel skyscraper.

Parametric Massing Basics

Week 1 - March 14th :

Preparation:

To be done prior to class on January 24th

Course Tutorials:

- Mandatory: Parametric Massing Basics video tutorial

Online Tutorials:

- Optional: online massing tutorial will be provided

Class Presentation:
"How to translate design intent into a parametric model"

Class Demonstration:

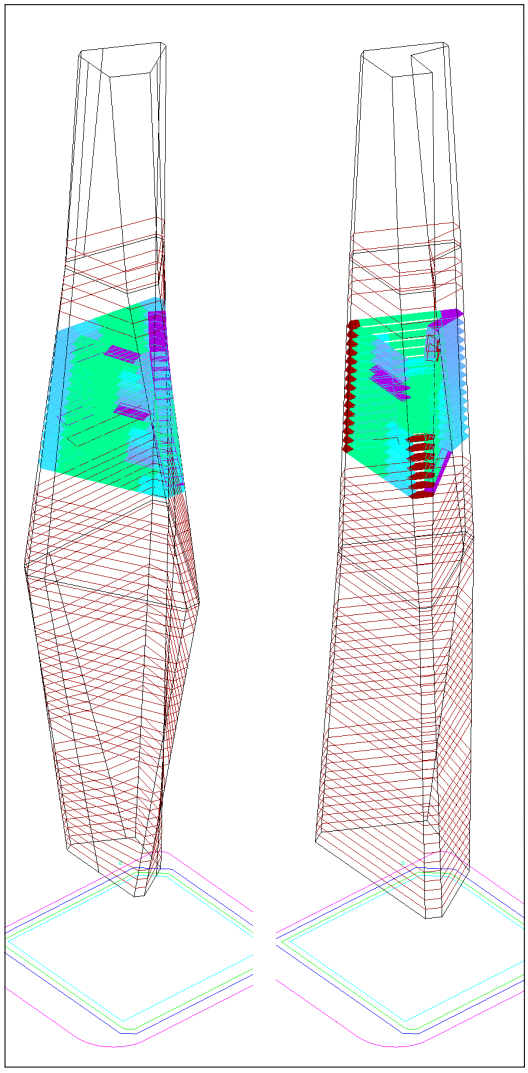
- Create massing: Rectangle, polygon, lofting, extrusion, etc.
- Basic Manipulation of Massing: Rotation, moving, scaling, etc.
- Stacking Diagrams and Basic Calculations: GFA and FAR.

Assignment:

- Make a diagram for you parametric massings. What are the geometric inputs? What can vary and by how much?
- Concurrent to making this diagram, take a first pass at building your parametric model in grasshopper.
- In preparation for the demonstration next class do "Advanced Massing Operations," "Data Driven Relationships," and "Box Morph" tutorials.

Saturday Help Session:

Optional: 202 Fayerweather, time TBD



Parametric massing with unit evaluation visualization

Advanced Parametric Massing

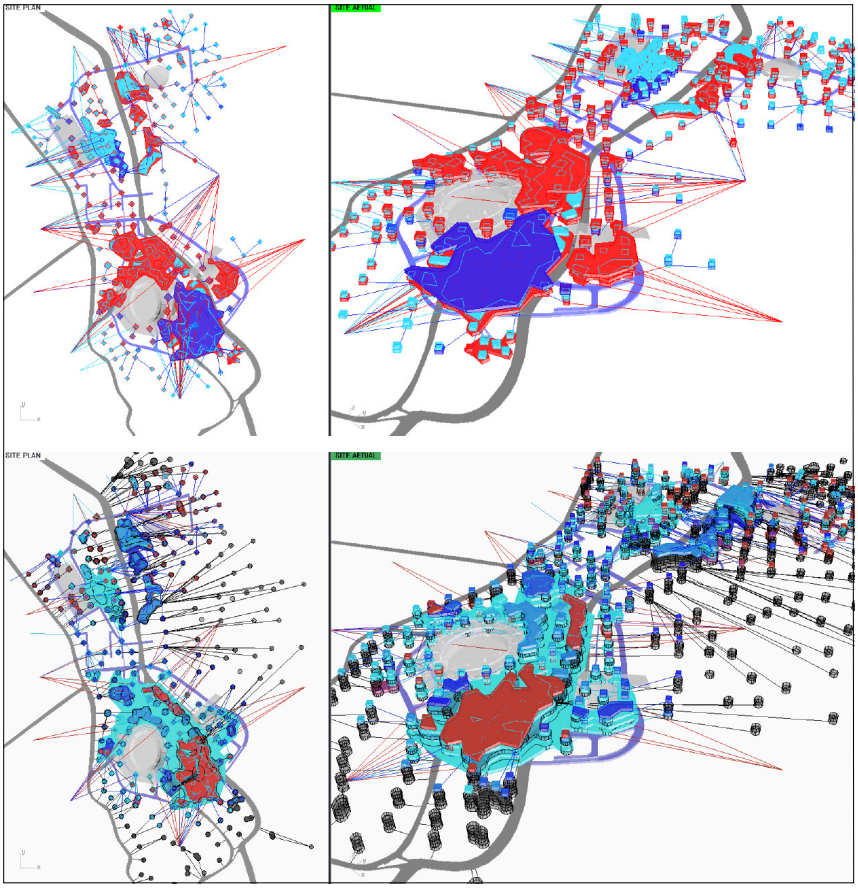
Week 2 - March 28th :

Review:
- Review and critique parametric massing diagrams.

Class Demonstration:
- Solid union/difference and trimming.
- Relationships driven by data, proximity, or constraints.
- Programmatic differentiation and iterating with fixed programmatic areas.
- Tactics for applying session A evaluation tools to parametric massings.

Assignment:
- Continue developing parametric massing.
- Apply custom evaluations developed in session A to your parametric massings.
- In preparation for the demonstration next class do Galapagos tutorial.

Saturday Help Session:
Optional: 202 Fayerweather, time TBD
Troubleshoot initial parametric massing and applications of session A evaluation tools.



Development of London Olympic Site Over Time - Heidi Werner

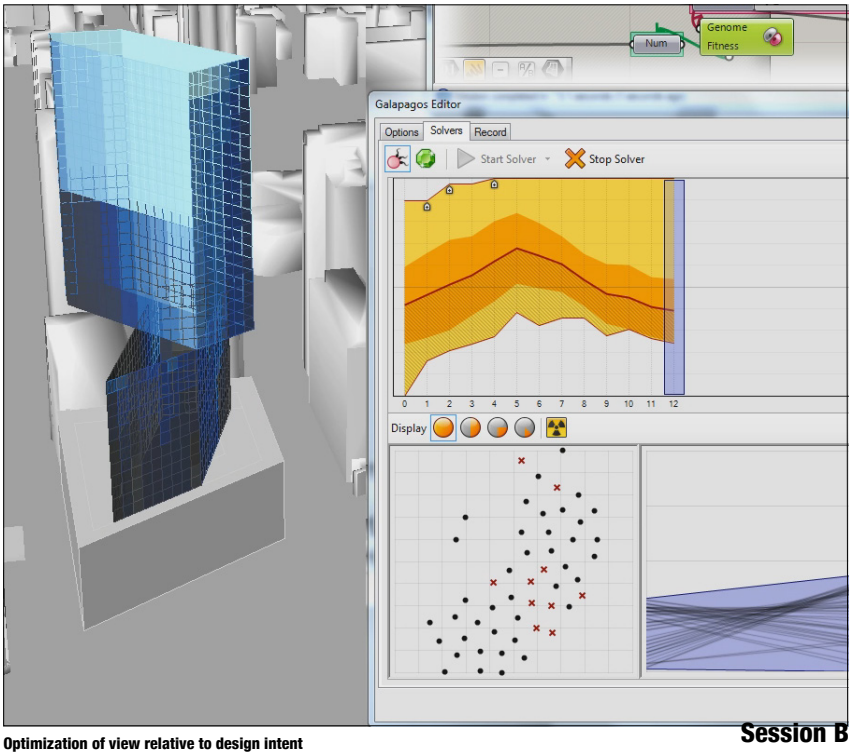
Optimization

Week 3 - April 4th :

Class Presentation:
"Introduction to Optimization: scenarios, variables, ranges, weighting, and establishing trends"

Class Demonstration:
- Optimization with Galapagos.
- Video screen capture.

Assignment:
- Run Galapagos on your parametric massings, optimizing for your session A evaluation tools.
- Make a trends diagram summarizing the results of initial optimization.



Optimization of view relative to design intent

Calibration

Week 4 - April 11th :

Review:
- Review and critique parametric massing diagrams.

Class Demonstration:
- Solid union/difference and trimming.
- Relationships driven by data, proximity, or constraints.
- Programmatic differentiation and iterating with fixed programmatic areas.
- Tactics for applying session A evaluation tools to parametric massings.

Assignment:
- Continue developing parametric massing.
- Apply custom evaluations developed in session A to your parametric massings.
- In preparation for the demonstration next class do Galapagos tutorial.

Saturday Help Session:
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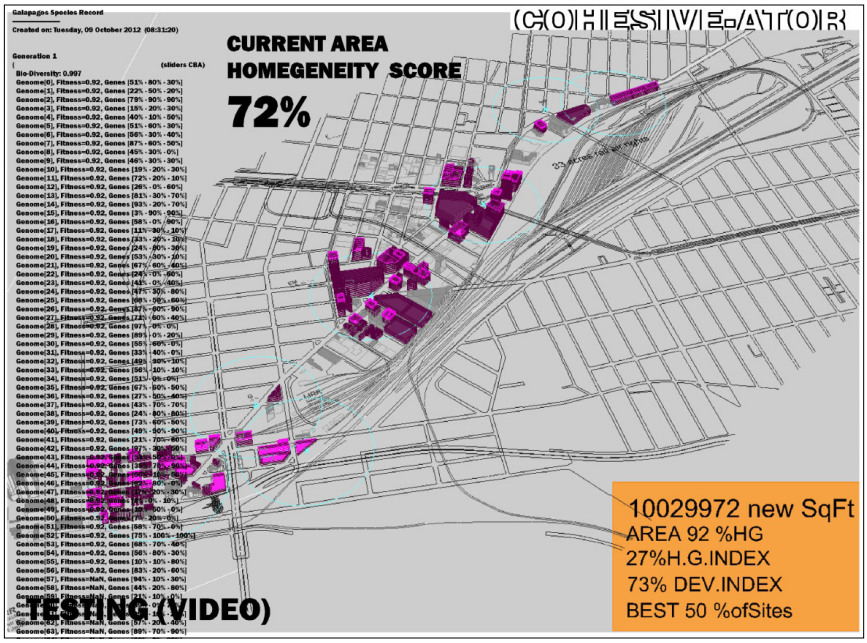
Troubleshoot initial parametric massing and applications of session a tools.



Massing Distribution. John Barrett

Individual Reviews

Week 5 - April 18th :

Review:
- Individual feedback on massing calibration.

Final Review

Week 6 - April 25th :

Deliverables:
- Coherent, sequential presentation how you achieved your objects, metric and design, by calibrating a parametric massing relative to a custom evaluation
- tool.
- GH definition and rhino file.