48-747 Shape Grammars

Spring Semester 9 units • UT 3.00-4.20 • CMB 2147

Instructor: Ramesh Krishnamurti ramesh@cmu.edu

Course Website:
http://www.andrew.cmu.edu/user/ramesh/teaching/course/48-747/
(under construction)

To introduce spatial grammars and their applications, primarily to design and composition.

Emphases on the formal and informal aspects of grammars, evolution of grammatical ideas, their relevance, application and use in the analyses of 'styles', synthesis of 'form', and incorporation of 'function', and not least, in teaching grammars to a computer.

Shape grammars, will be examined in detail.

For nearly four decades, grammars have been used extensively to understand styles of architecture, landscape design, fine art and ornament.

course objectives

Fundamental notions of grammars and rewriting systems, languages of grammars

Introduction to shape grammars and their properties

Transformations of grammars

Other kinds of spatial grammars
e.g., structure, solid grammars, graph and color grammars

Application of grammars to aspects of architecture and urban design

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Application of grammars to other disciplines

Weights, sorts and augmented spatial grammars

Implementing shape grammars [and other spatial grammars]

Recent trends in grammar research

Other topics suggested by students

course topics

Students will be ***evaluated*** on a full semester course (worth 9 units).

Students will be ***initially evaluated*** for a mini course (worth 6 units) made up of assignments.

The project and any accompanying preparatory assignments will be worth an additional 3 units.

course credit

Grammar assignments (5 units)

In class participation (1 unit)

First

Project + any preparatory assignment (3 units)

OR

Computational assignment (3 units)

Second

Required of all CD graduate students

assignments

Reflection of your affinity and flair for the subject matter.

A 90+ **B** 80+ **C** 70+

A (excellent) means that you have scored at least B or better in each assignment.

B (good) means that you have at least successfully completed each assignment.

C means you do not fail the course, and you either you performed uniformly, or poorly in one of the assignments.

grading

Course geared towards everyone doing well

Have a tendency to mark ***hard assignments leniently*** and ***easy assignments hard***.

Written parts for any assignments must be ***grammatical***.

Drawn parts for any assignment must be ***neat*** (if you can't freehand neatly, use a computer drawing program).

Programmed parts or algorithms for any assignment must have ***a clear logic***

expectations

Constructive Aspects

Generative Process/System

Algorithmic/Computational Systems

in this course we look at

Design

Description

Procedure

Grammar

Style

Paradigm

Transformation

Emergence

Continuity

Models

Algebra

Arithmetic

Shape algorithms

Implementation

Grammar systems

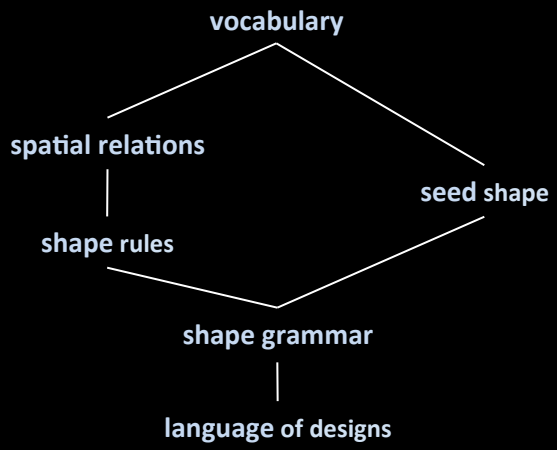
…

Weights

Sortal structures

some key ideas that we will touch upon in the context of grammars

art of the grammarist

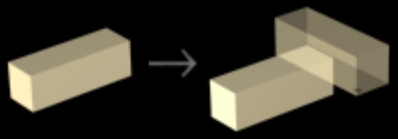


motivated by Frederick Froebel's Kindergarten model of free play and creativity through his gifts

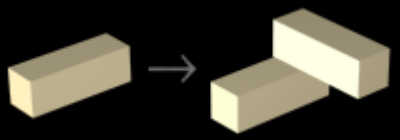
vocabulary + spatial relations

a design

free play

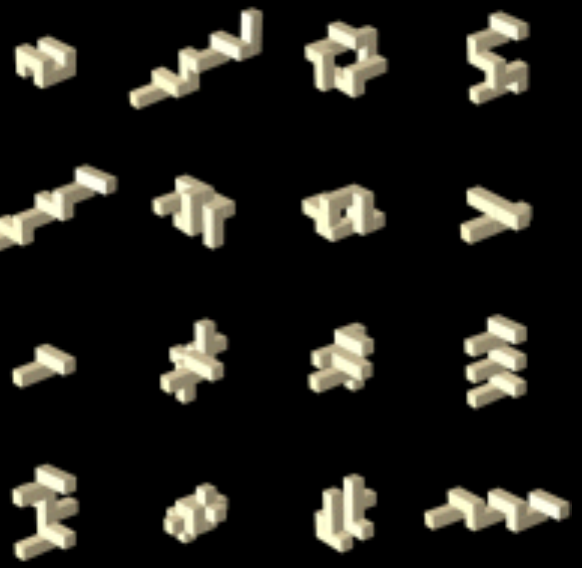


additive shape rule



subtractive shape rule

language



paradigm: child's play

in a shape grammar one can find …

structure

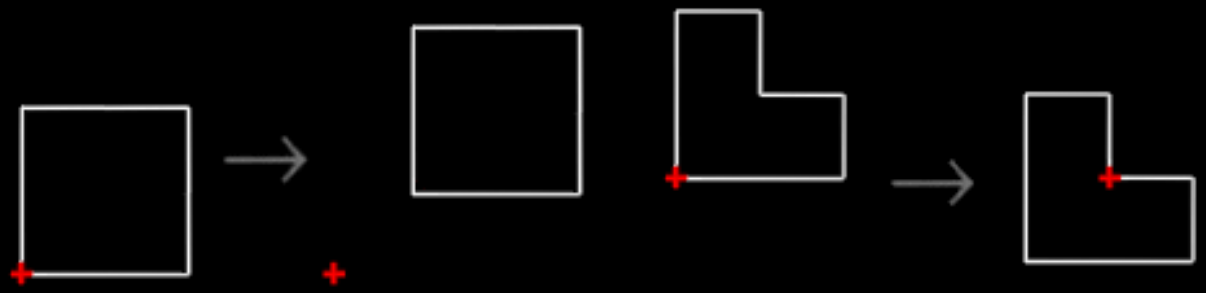
order

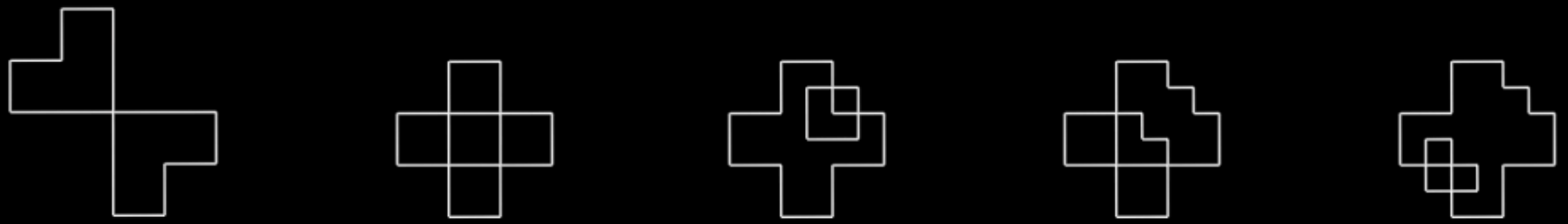
chaos

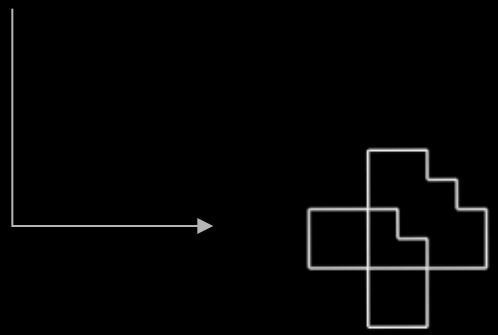
ambiguity

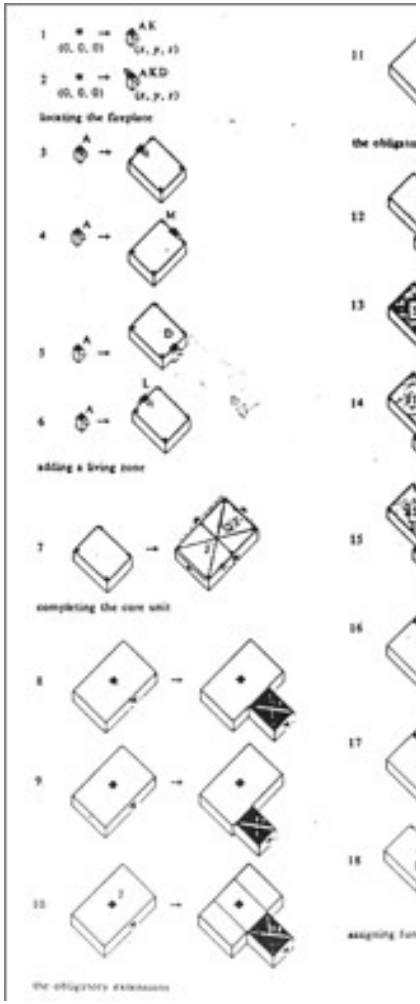
emergence

meaning

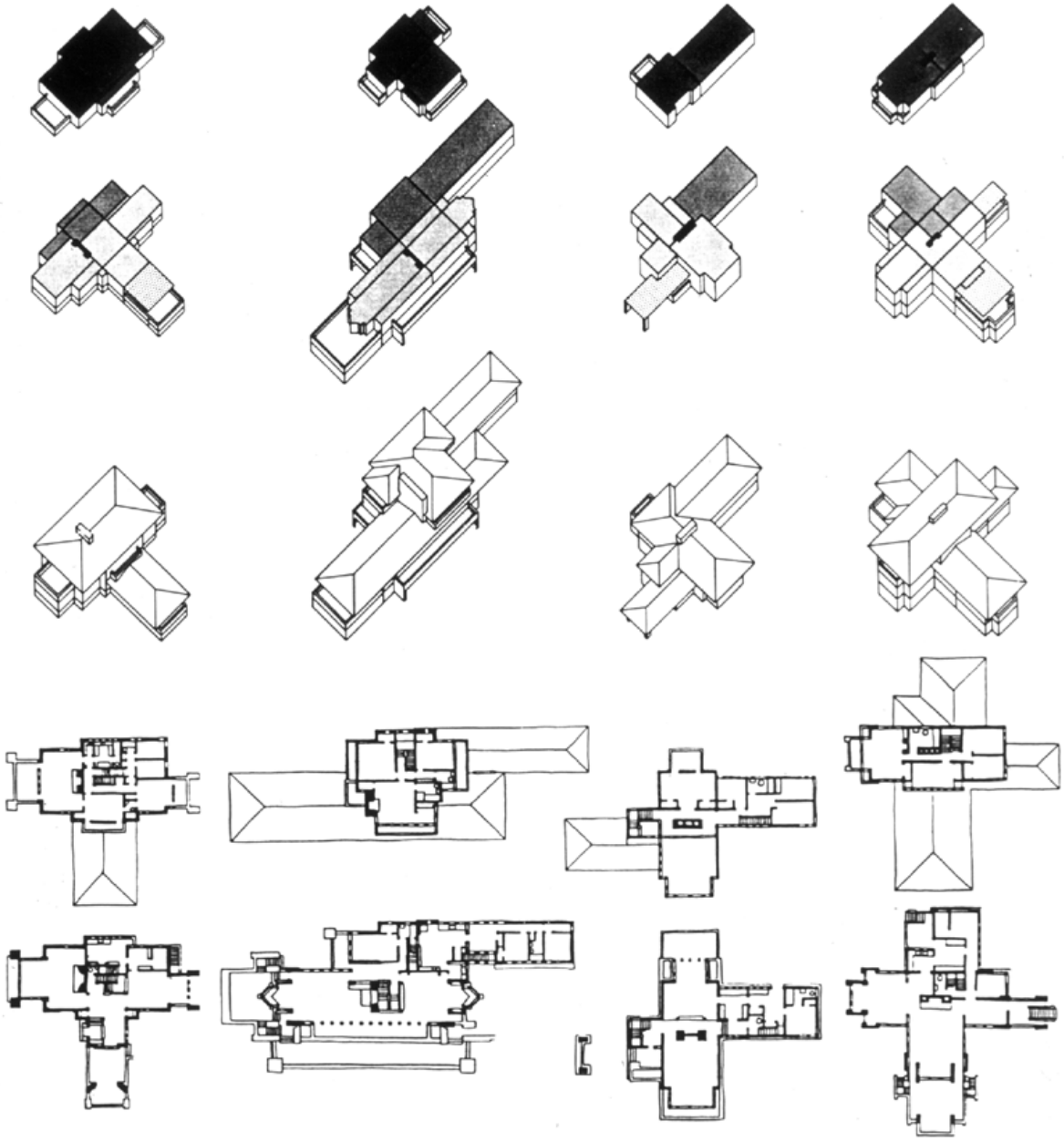




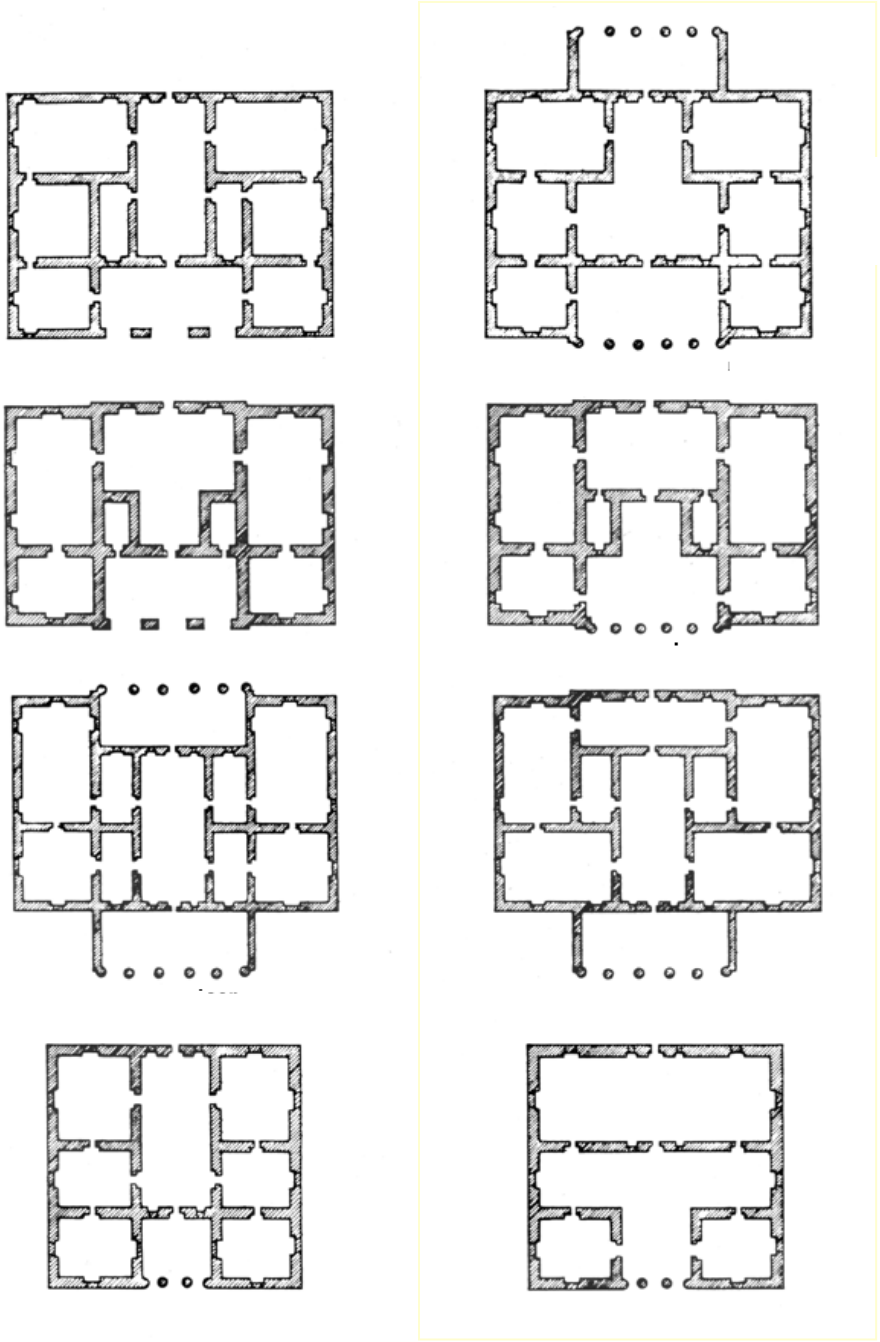




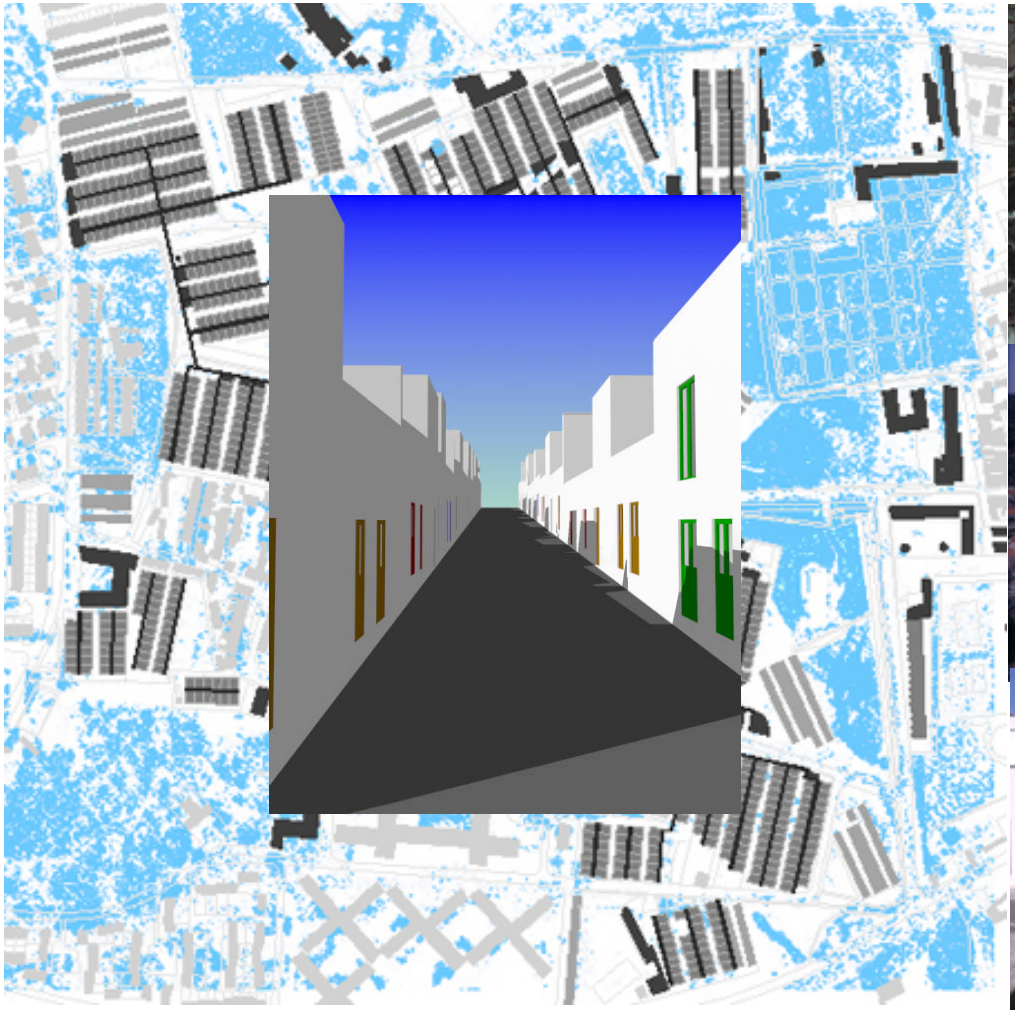
prairie houses of fra

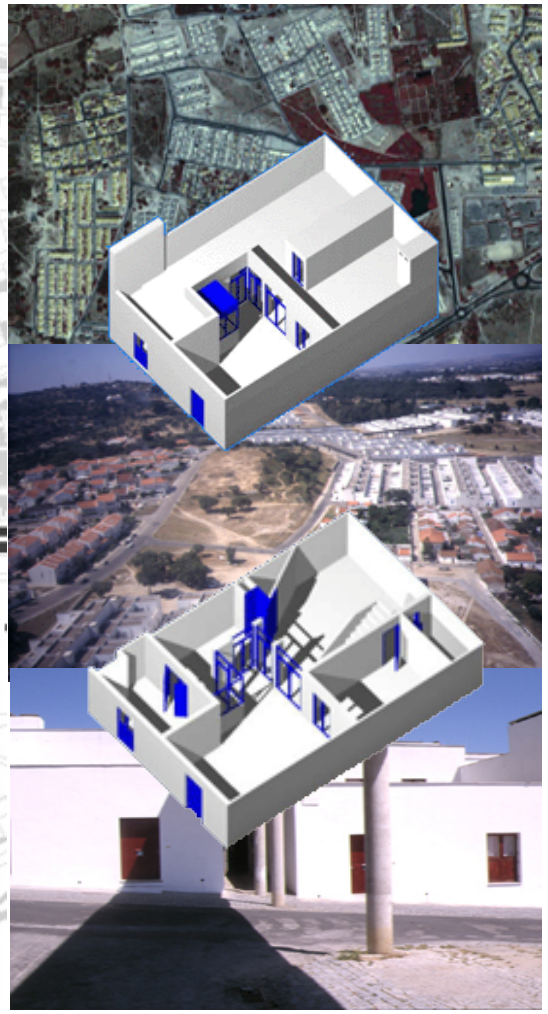


go to introductory lecture



palladian grammar



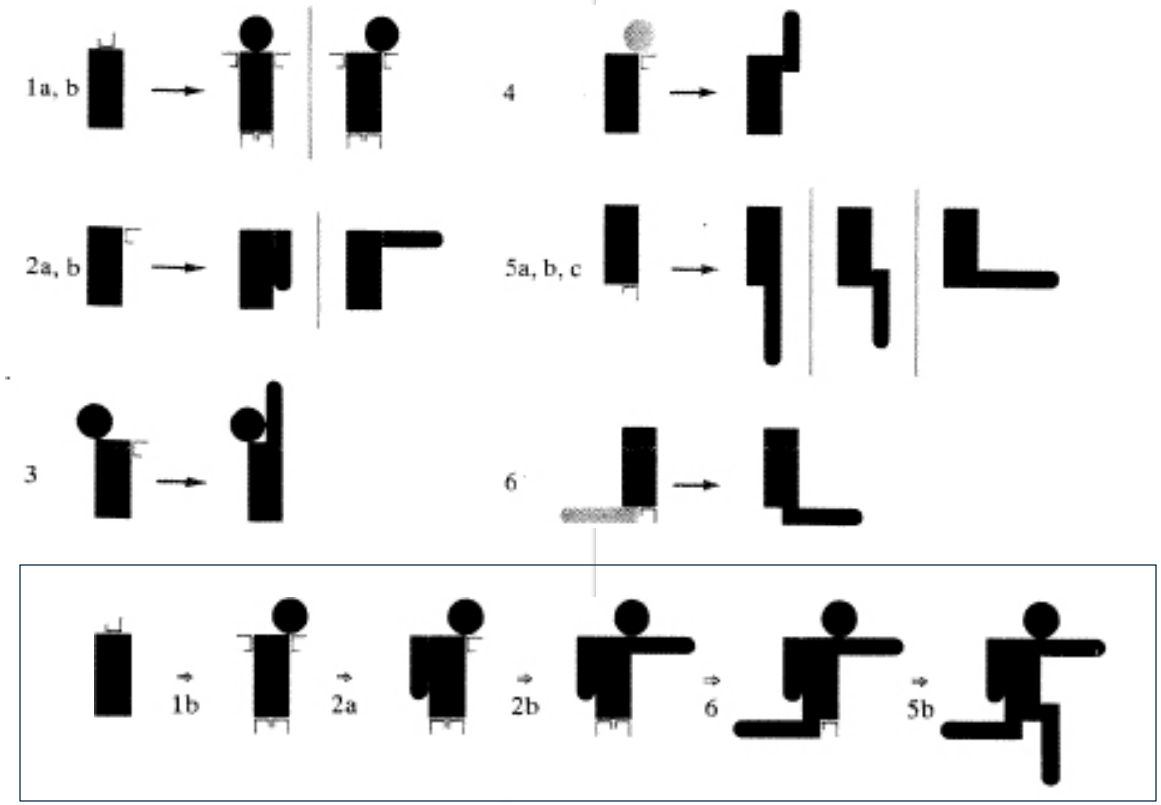


malagueira

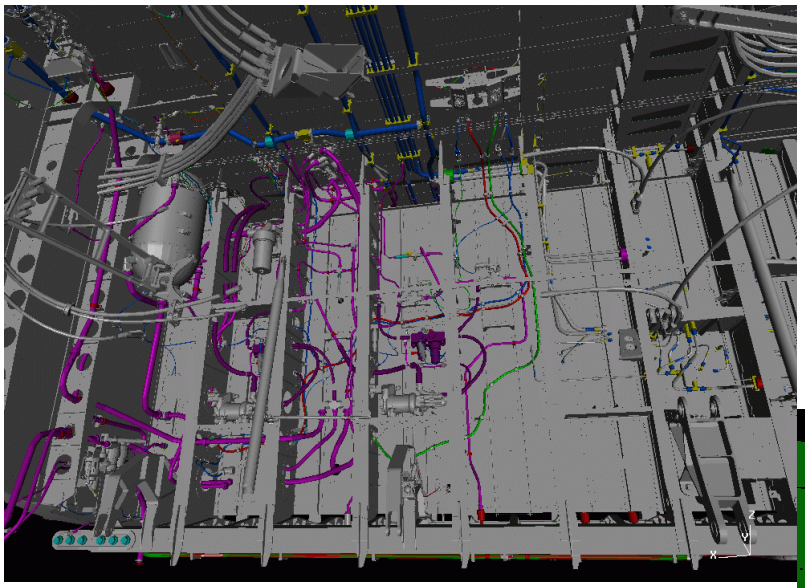
Generation of Zhāi-zing shān-zhuān
(A three dimensional exposition)

procedural modeling

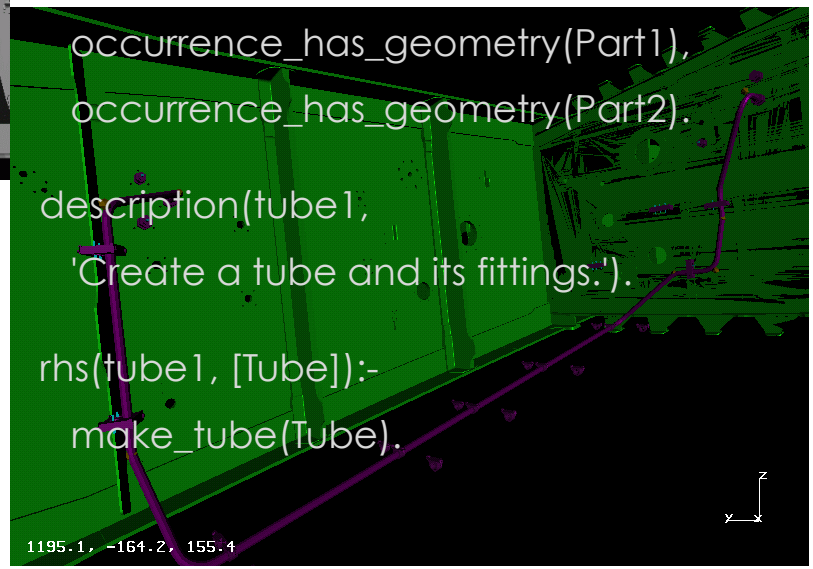
procedural modeling



structures grammar

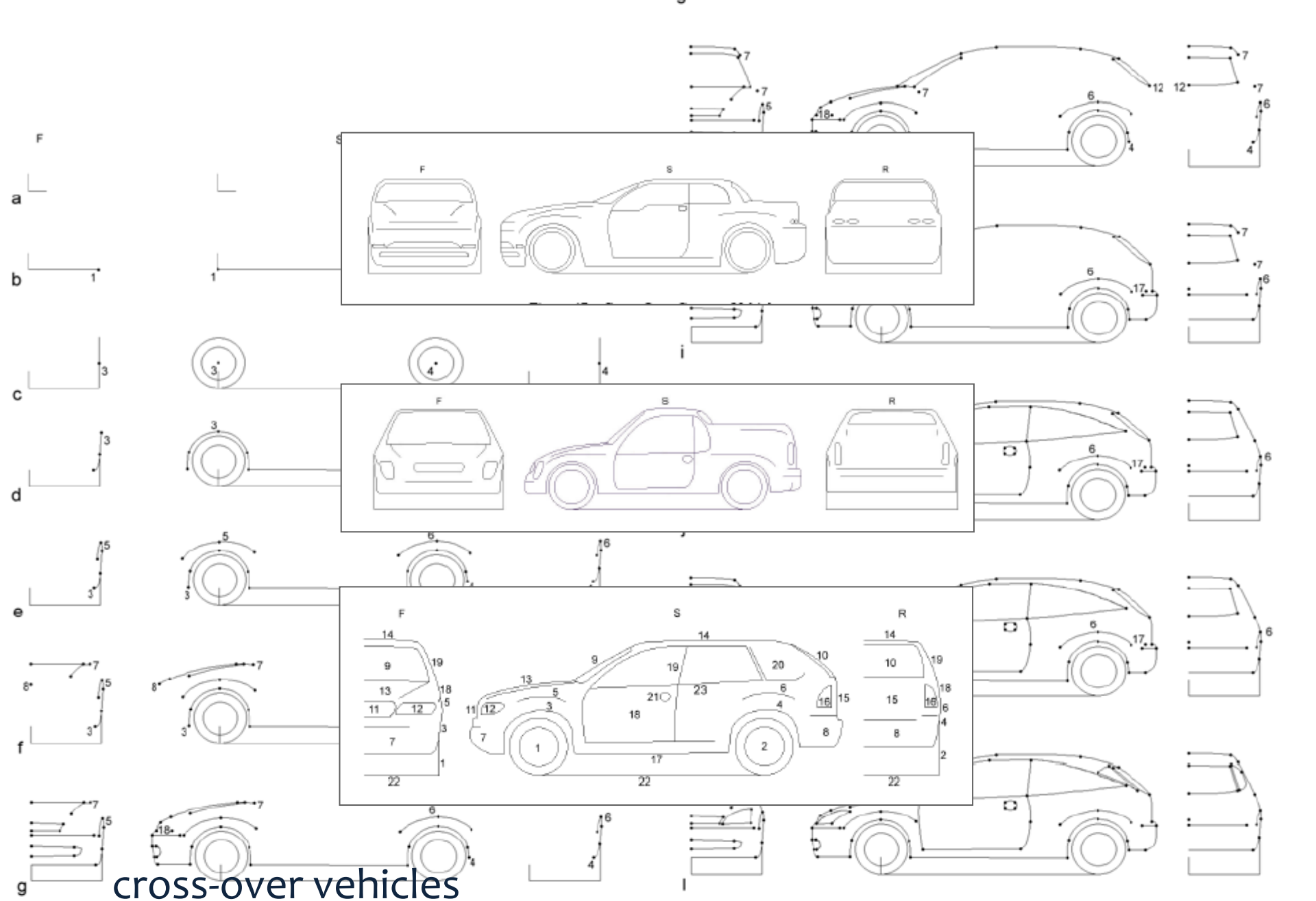


```
condition(tube1,
    'Tube has no geometry.').

lhs(tube1, [Tube], [Part1, Part2]):-
   schematic_tube_connections(Tube, Part1, Part2),
    in_context(Tube),
    not occurrence_has_geometry(Tube),
    occurrence_has_geometry(Part1),
    occurrence_has_geometry(Part2).

description(tube1,
    'Create a tube and its fittings.').

rhs(tube1, [Tube]):-
    make_tube(Tube).
```



piping in the landing bay – boeing 777

queen anne houses



cross-over vehicles

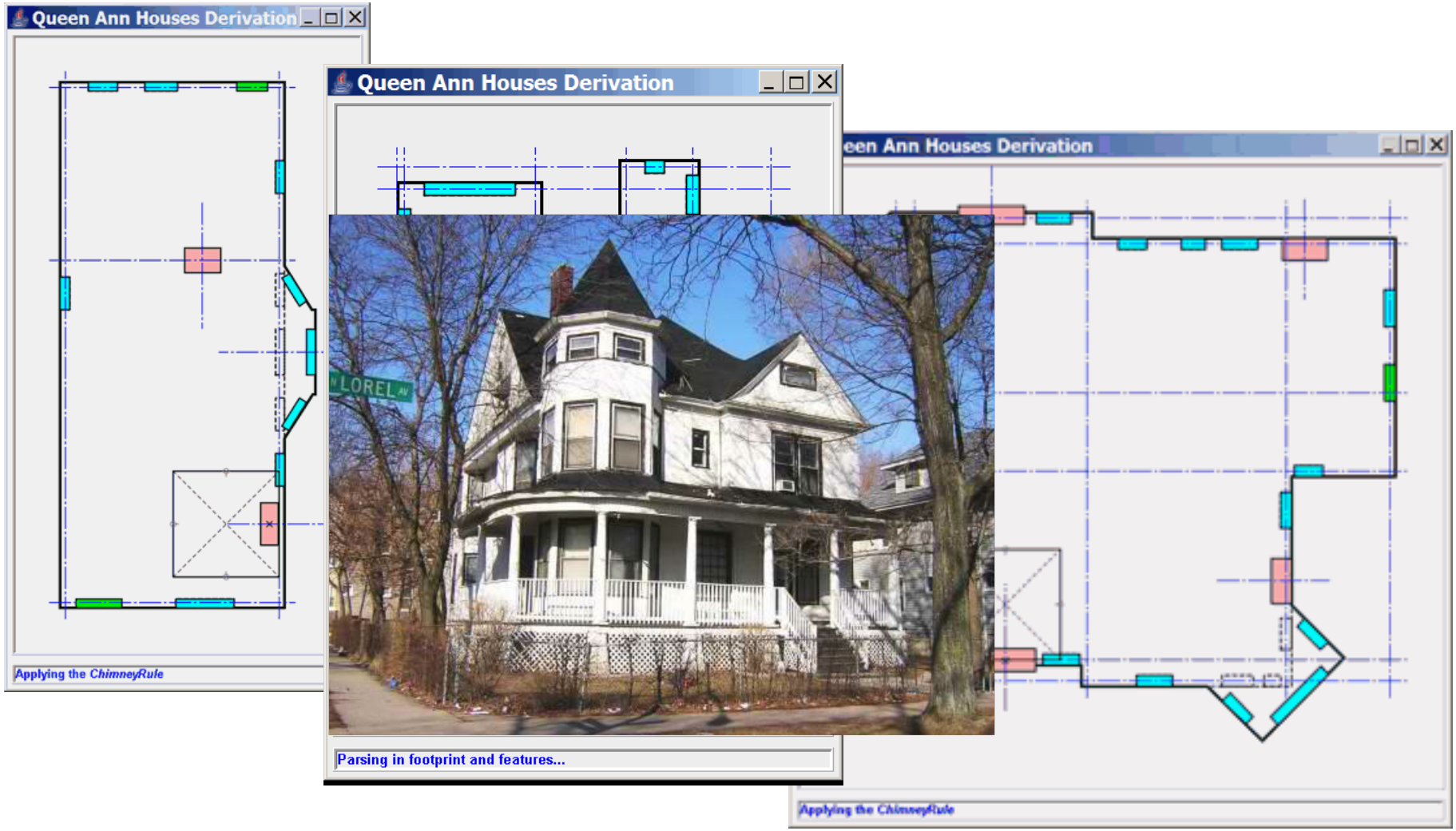

Queen Ann Houses Derivation
Applying the ChimneyRule
Queen Ann Houses Derivation
LOREL AV
Parsing in footprint and features...
een Ann Houses Derivation
Applying the ChimneyRule

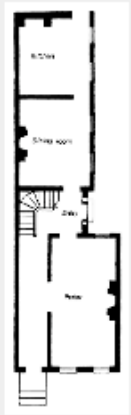
Fig. 9. Row of two-and-a-half-story, federal style houses, built 1815–20. 815–829 South Charles Street, Baltimore. Andrew Rohr's row, 815–819, is on the left, John Cator's row, 821–829, is on the right. (Photo, M. E. Hayward.)

Baltimore rowhouses

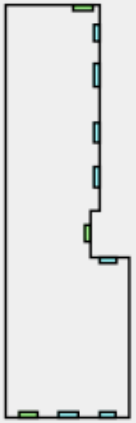
PILOT

File View

Ground truth

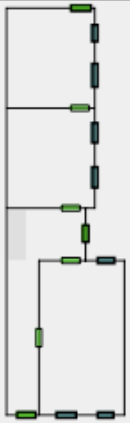


Feature input model

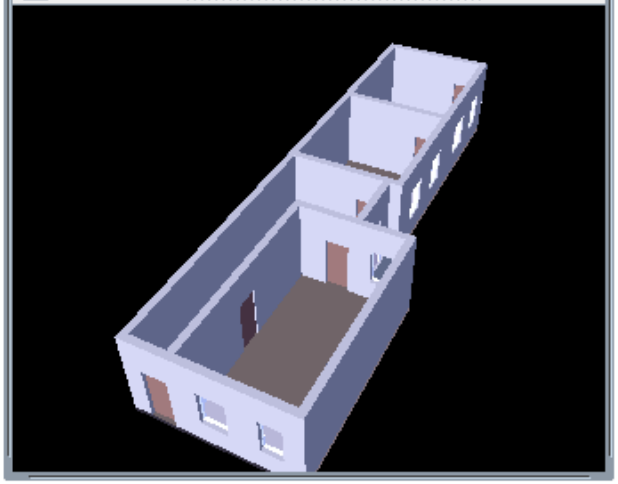


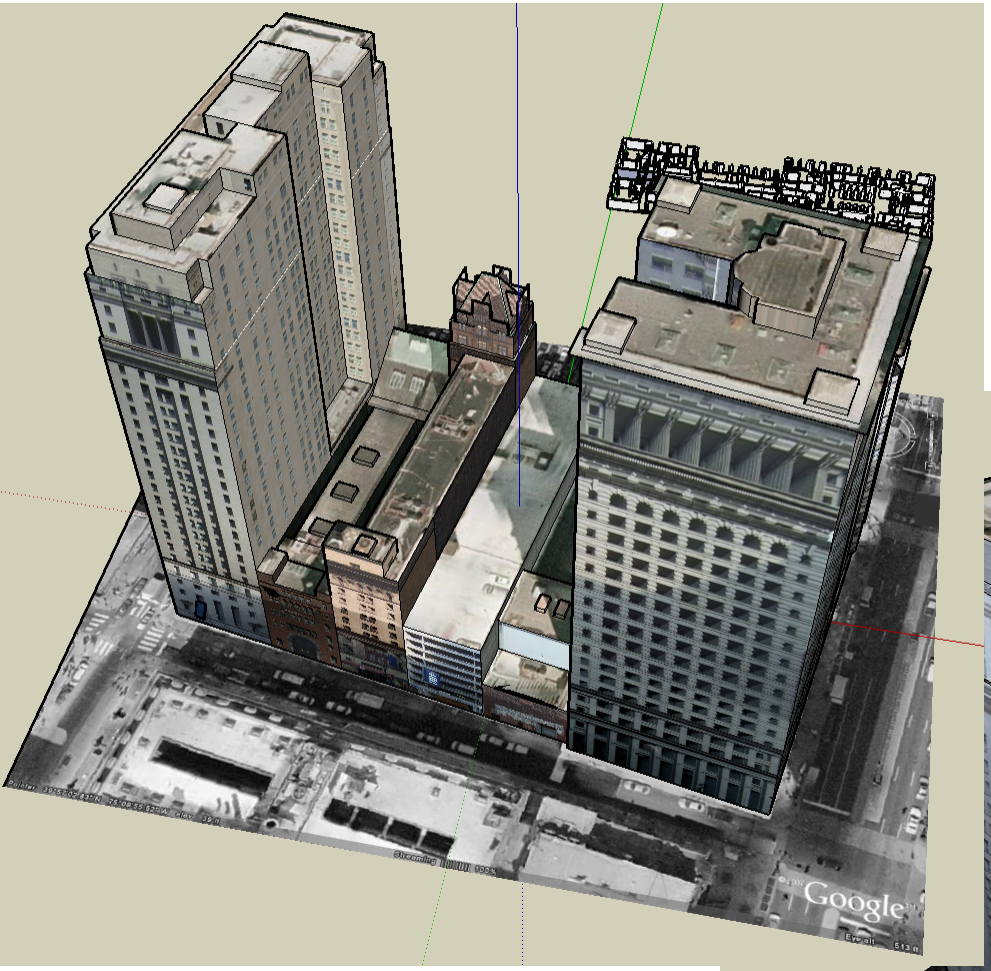
Internal layout representation

Layout output XML



Layout 3D





high-rise
apartments