Procedural Modelling of Park Layouts

Masterstudium:
Visual Computing

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Intention

- Entirely automated city generation
- Synthesis of streets, building parcels, building as well as vegetation has been comprehensively considered in the state of the art
- **Park generation** has space for improvement

Parks

- Input is a city block region, which is normally filled with buildings
- The input is partitioned into subregions like paths, lawn areas, plant beds **(1)**
- Vegetation is added **(2)**

Research Questions

- Capturing patterns of real-life parks
- Choice of procedural methods
- Fitting a complex polygon to a simpler one
- Curved boundary region synthesis
- Vegetation placement strategy

Implementation

- Shape Grammar employed for partitioning
  – „Structural patterns": Grid, Cells, Rays **(4)**
  – Boundary „insetting": Peel **(6)**
- Geometry simplification and Bounding Rectangles to fit a complex input to a quad for the Grid pattern / rule **(3)**
- Poisson Distribution for object placement **(7)**
- Symmetry in indexing and sample placement
- SketchUp extensions[†]

Other Contribution

- „01"-Indexing used for outer and inner boundary subsets **(5)**
- Hint Shapes for rule-contextual shape fitting
- Smoothed Voronoi Cells for curved boundary region synthesis

Concept

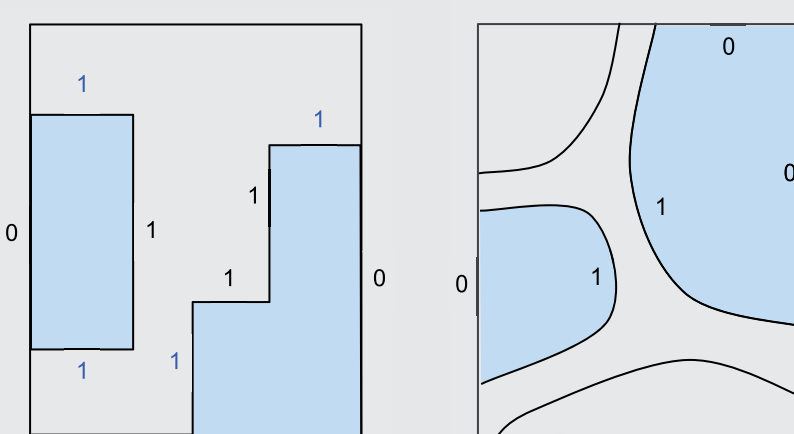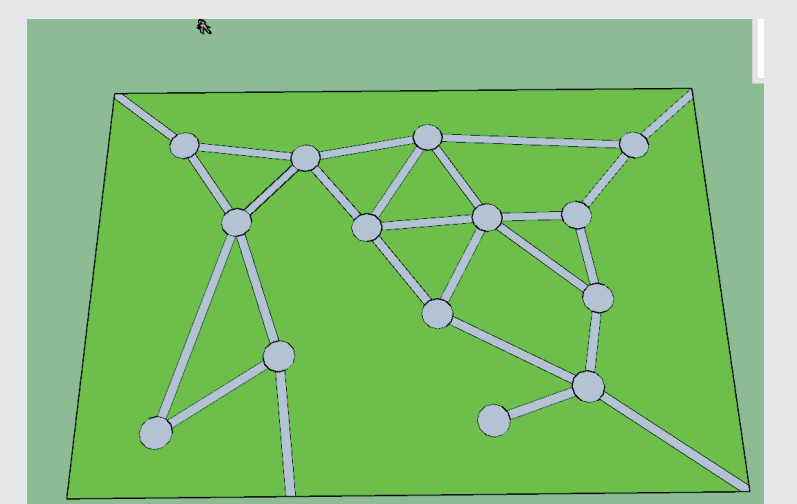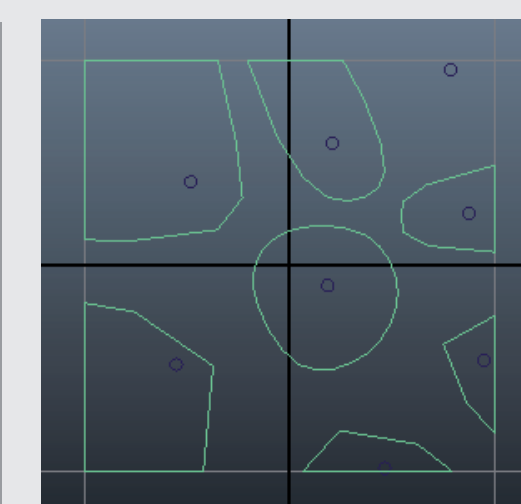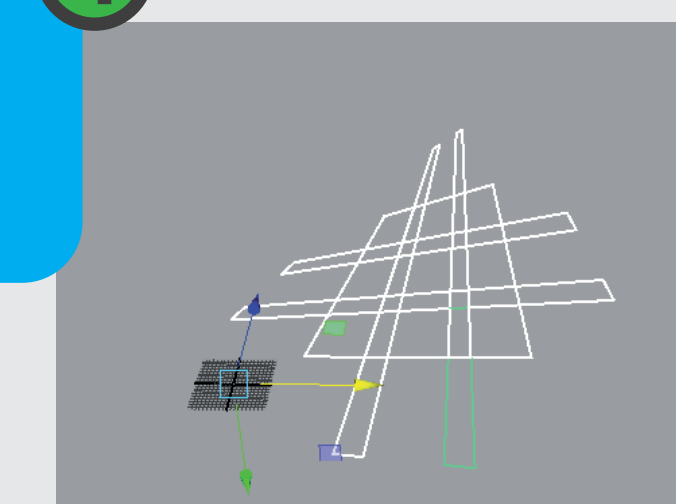Partitioning of an input region followed by vegetation placement.
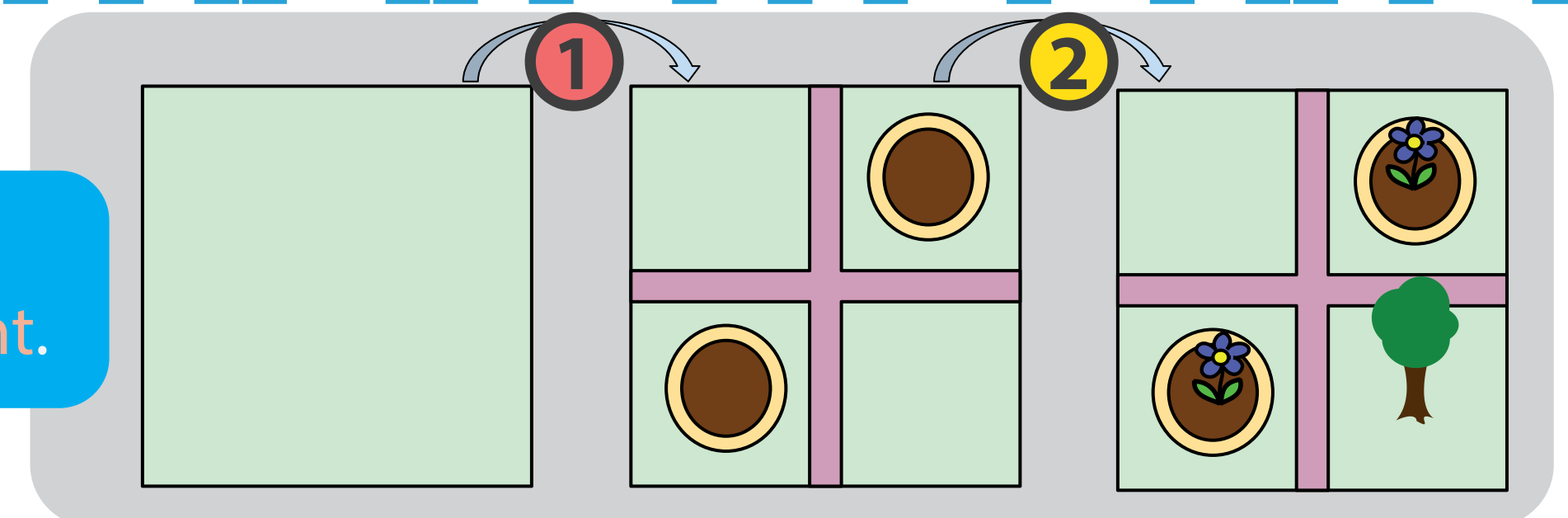
Methods

A complex city block mapped to a simpler polygon using shape fitting. Necessary to create Grid-like parks. **(3)**
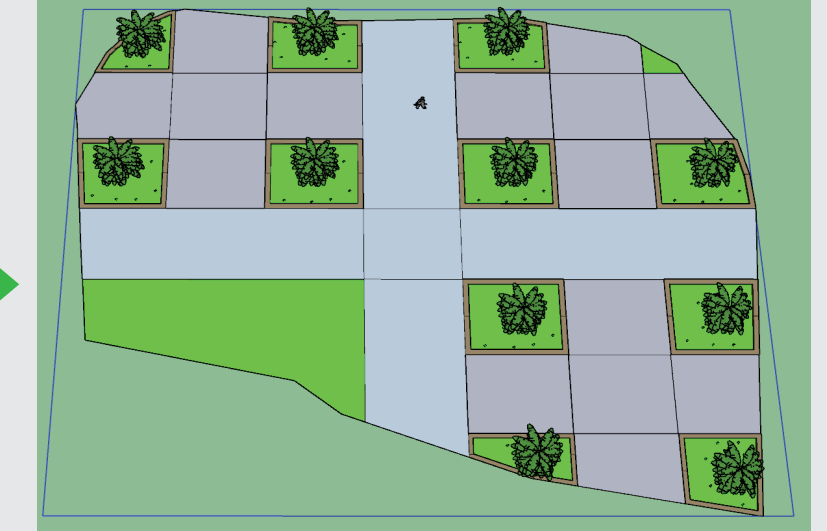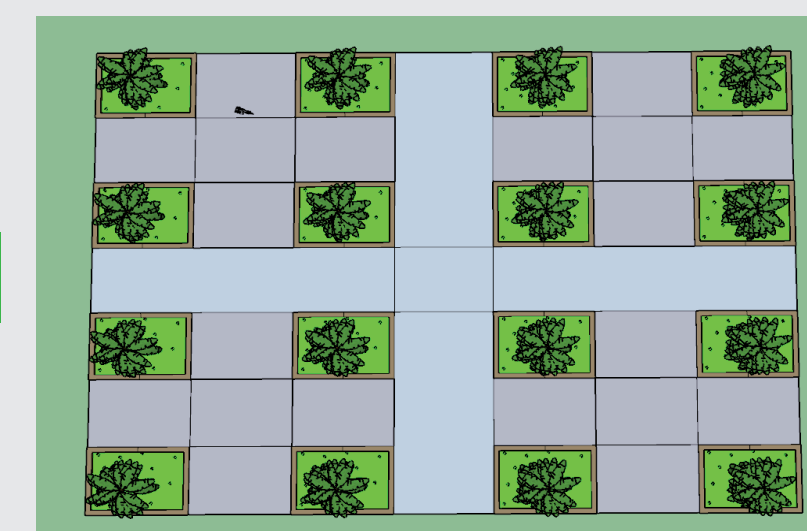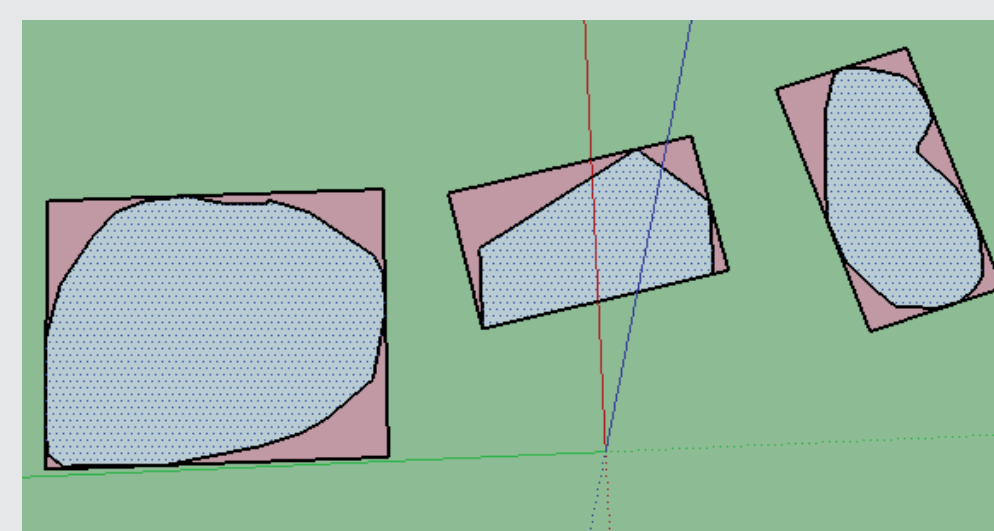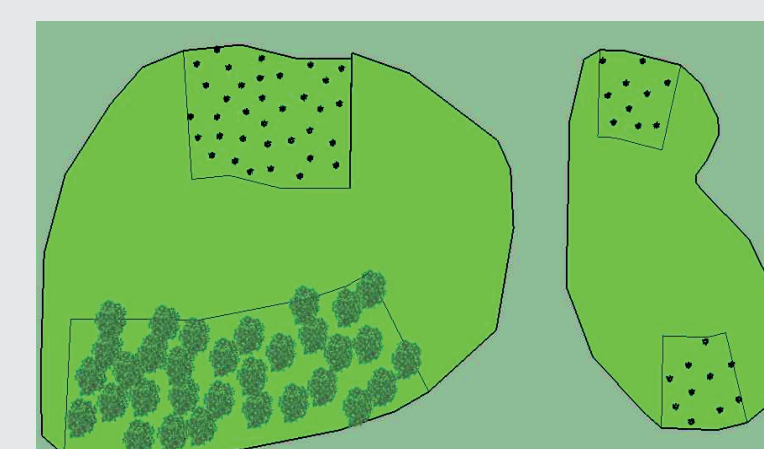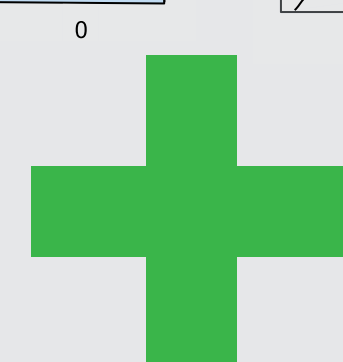
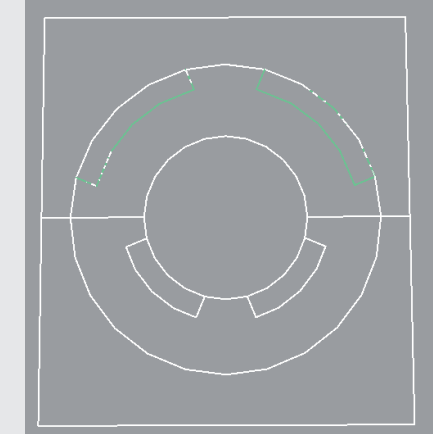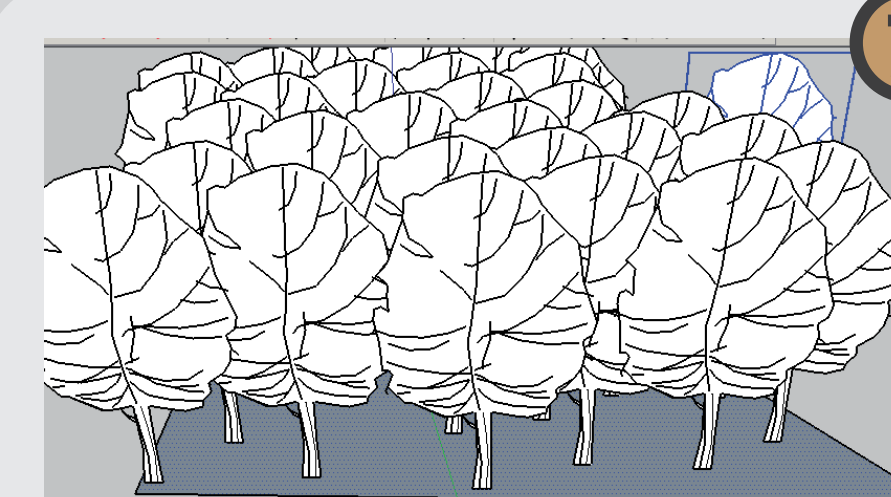Structural partitioning of a region using **Grid**, **Cells** and **Rays** rules, which define the general layout of the park. **(4)**

Selection based on logical edges and edge orientation allows targeting a subset of a shape polygon boundary. This is used by insetting and placement operations, implemented in the **Peel** and **Place** rules.

Placement of the vegetation and other objects occurs using Poisson distribution with blue noise qualities. **(7)**

Results

Three types of layouts have been achieved. Parks can be generated in regions of various sizes and shapes. Symmetry is accomplished by mirroring indexing and Voronoi cell centre positions in the Grid and Cells rule respectively.

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