Simplification of 3D Building Data

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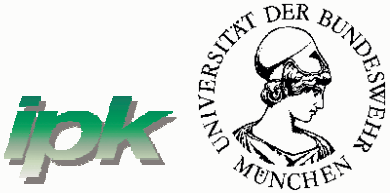
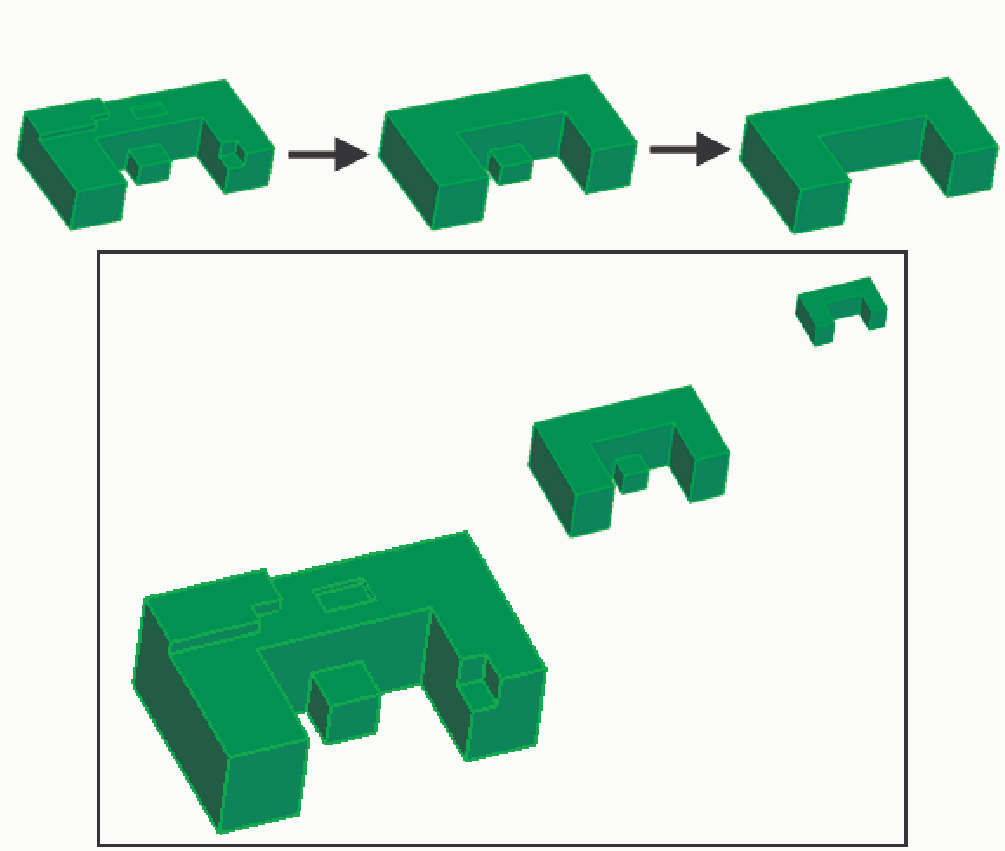


Introduction

Level of Detail (**LOD**) concept: The further an object is away, the less detail is needed



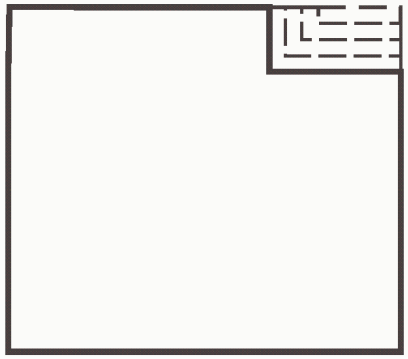
Introduction

- Goal: Automatical derivation of coarser 3D building models (using scale-space theory)
- Input data: VRML-scenes or Sat-files
- Process: C++ and ACIS Geometric Modeler (http://www.spatial.com)

Scale-Spaces and Simplification

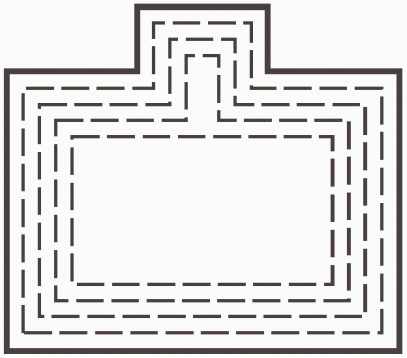
- Scale-spaces for vector data: Shifting of elements (edges for 2D, facets for 3D) inwards or outwards

Curvature Space



only specific elements shifted

Mathematical Morphology



all elements shifted

Original

Movement of the Facets

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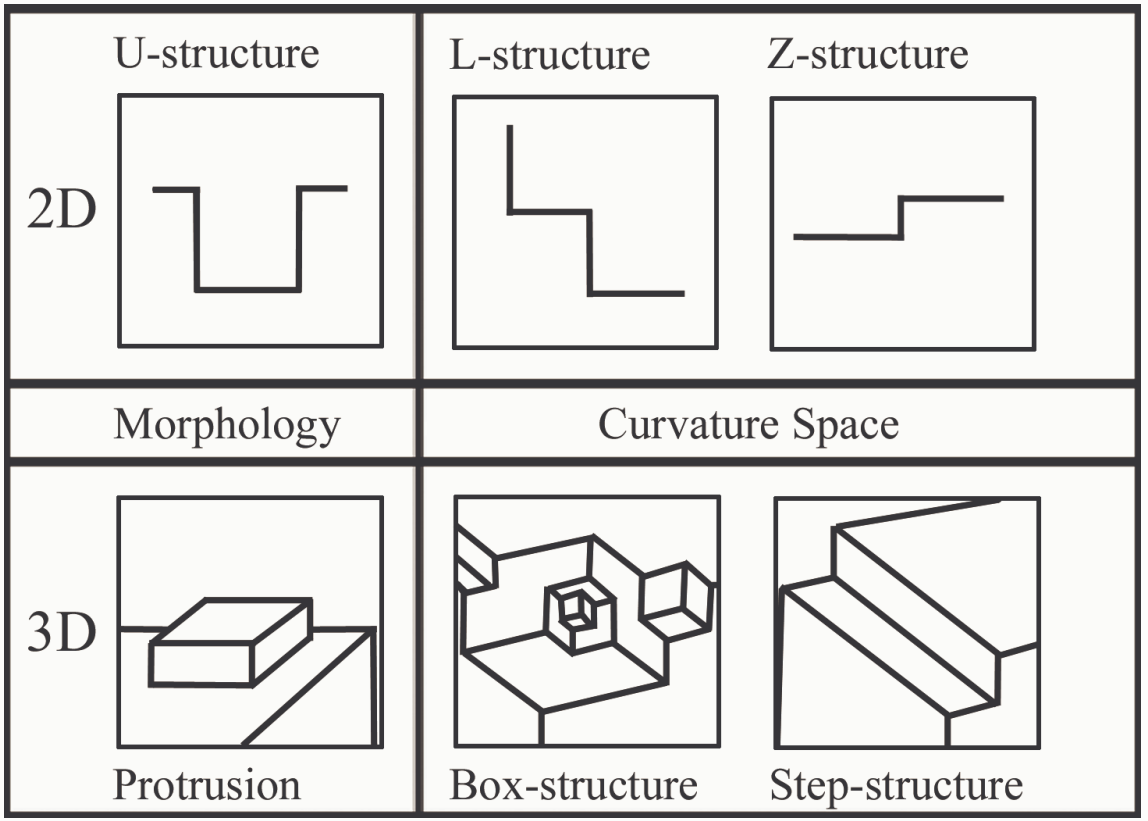
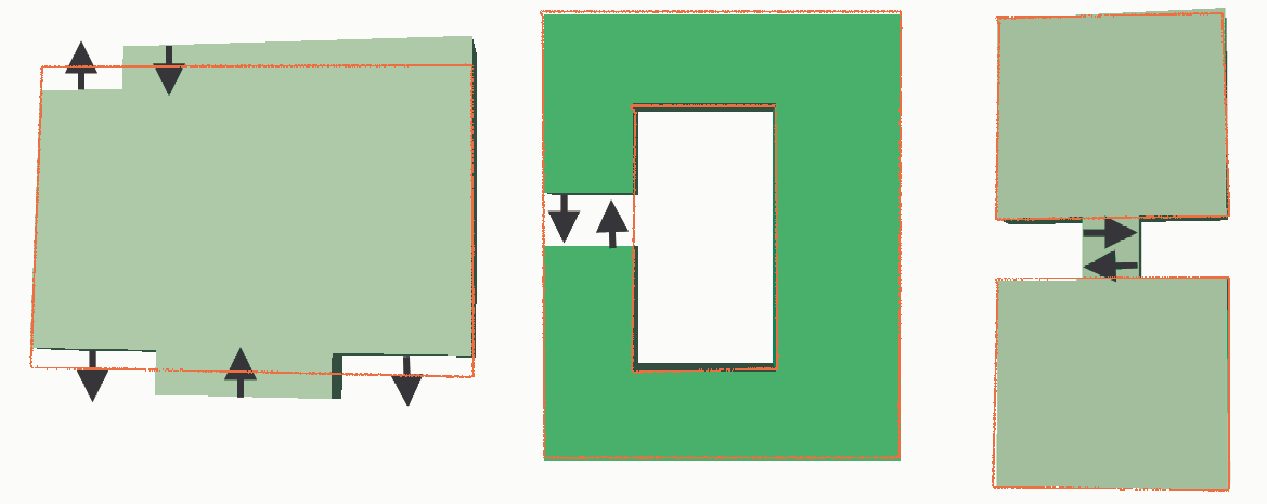
Scale-Spaces and Simplification

- Mathematical morphology and curvature space are needed for different structures

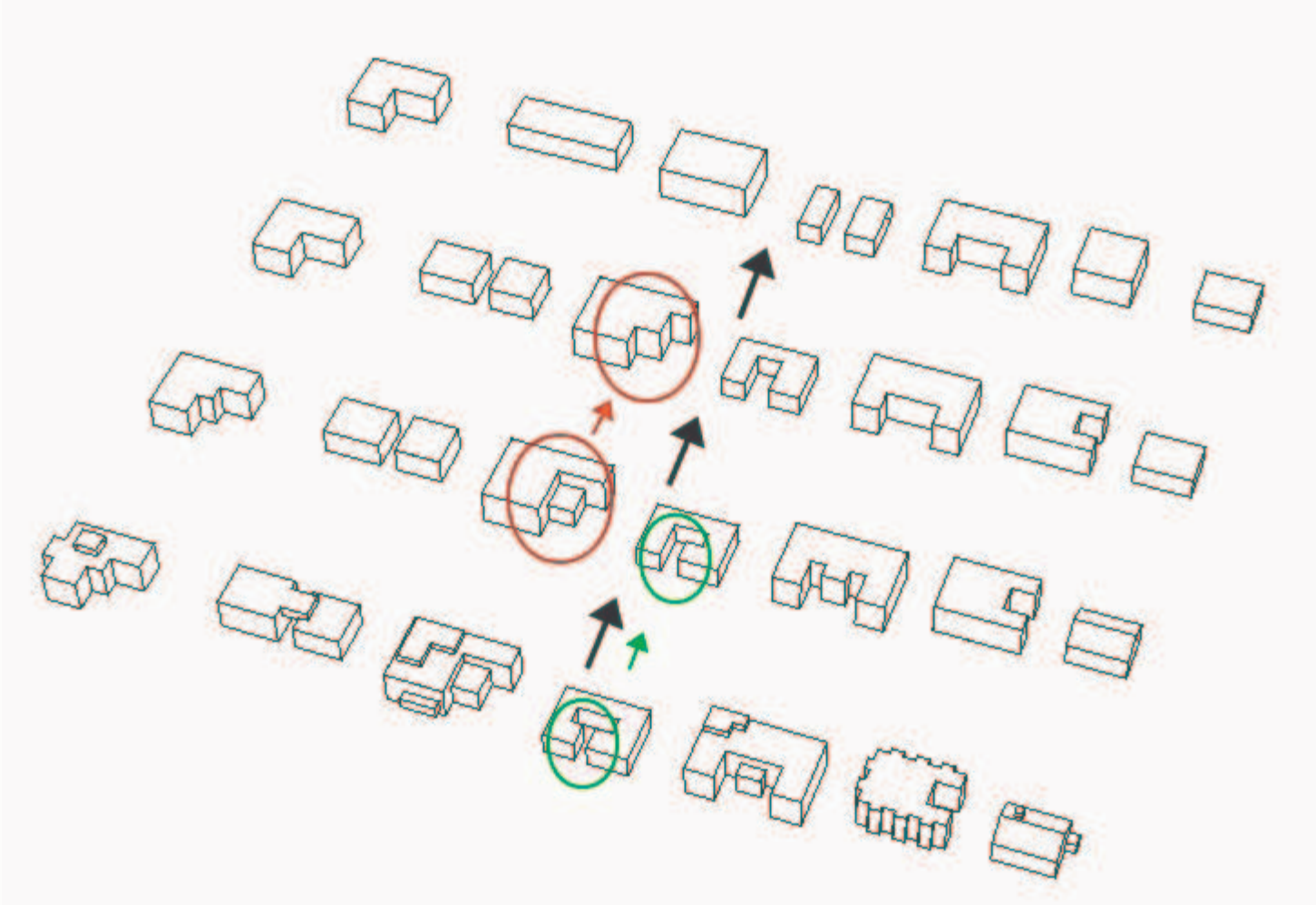


Parallel Shift

- Approach combining advantages of mathematical morphology and curvature space: Shifting of facets when parallel and under specified distance



Results for Parallel Shift



Squaring

- Simplification works well mainly for orthogonal structures

  $\Rightarrow$ procedure for squaring needed

- Squaring of 3D objects not trivial

  $\Rightarrow$ main directions have to be taken into account

  $\Rightarrow$ differentiation between roof-squaring and wall-squaring

- Focus on roof-squaring

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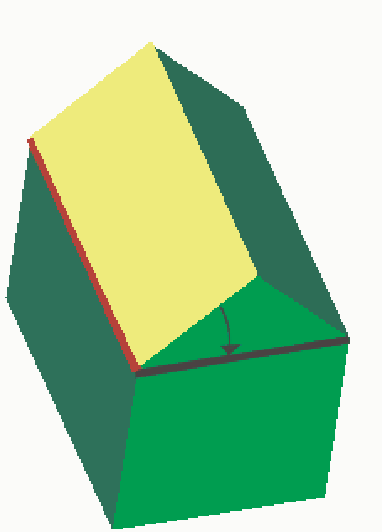
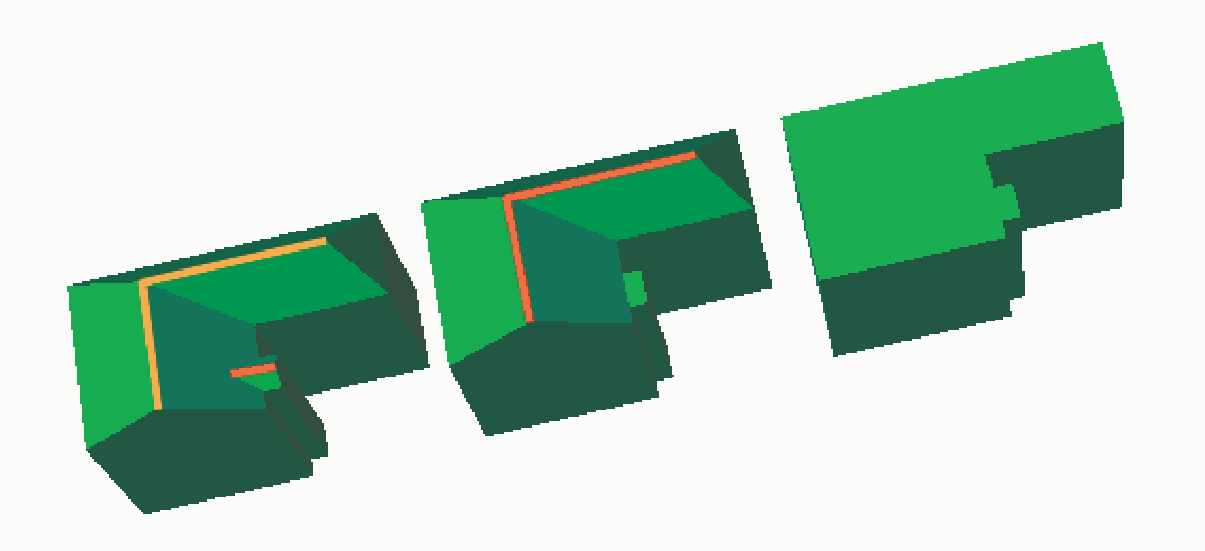
Roof-Squaring

- Analysis of roof-facets: connected ridge-lines ⇒ roof-units ⇒ selection of smallest roof-unit

- Squaring: rotation of selected roof-facets around eave- or ridge-lines (tapering)





red: smallest roof-unit, yellow: larger roof-unit

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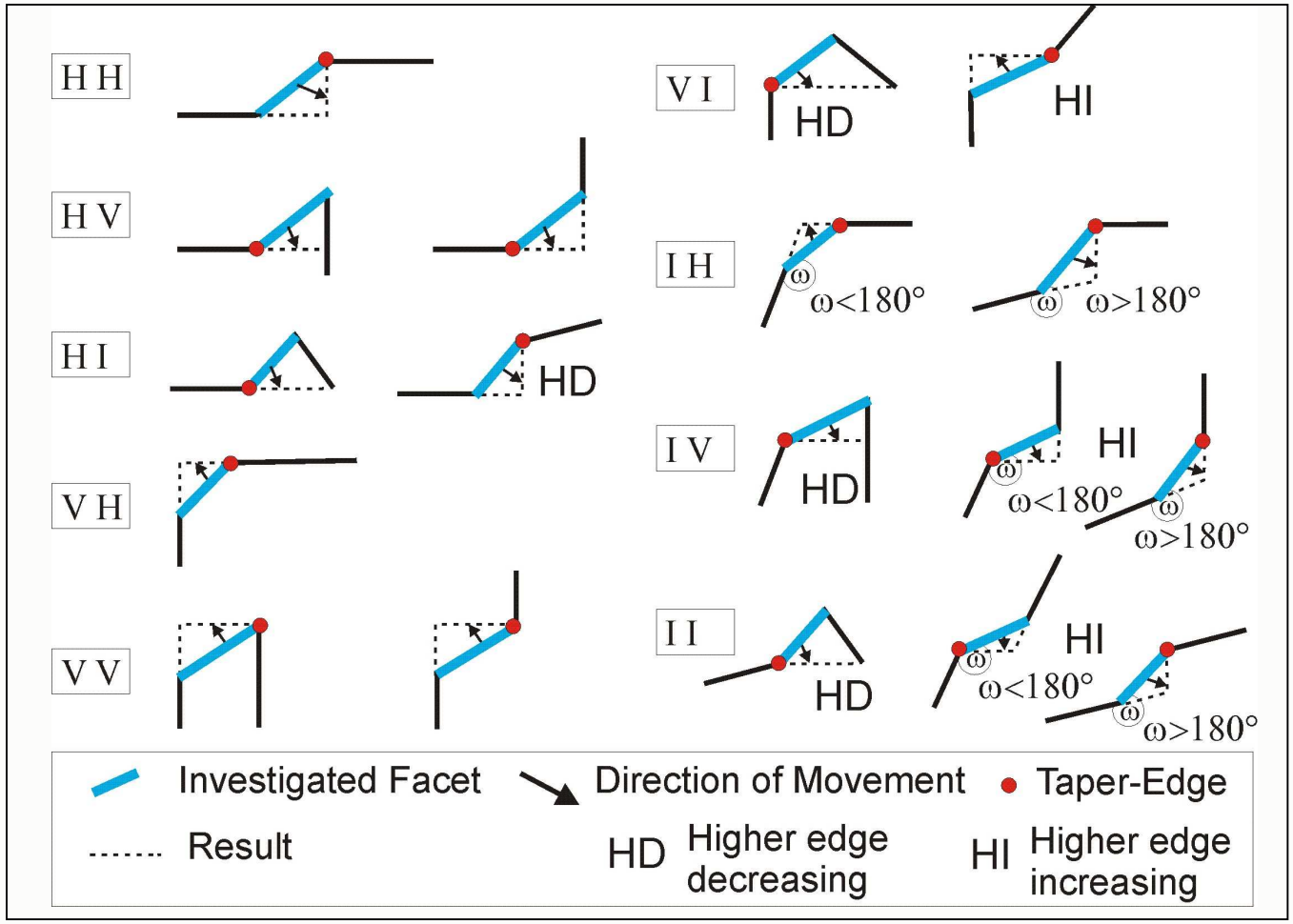
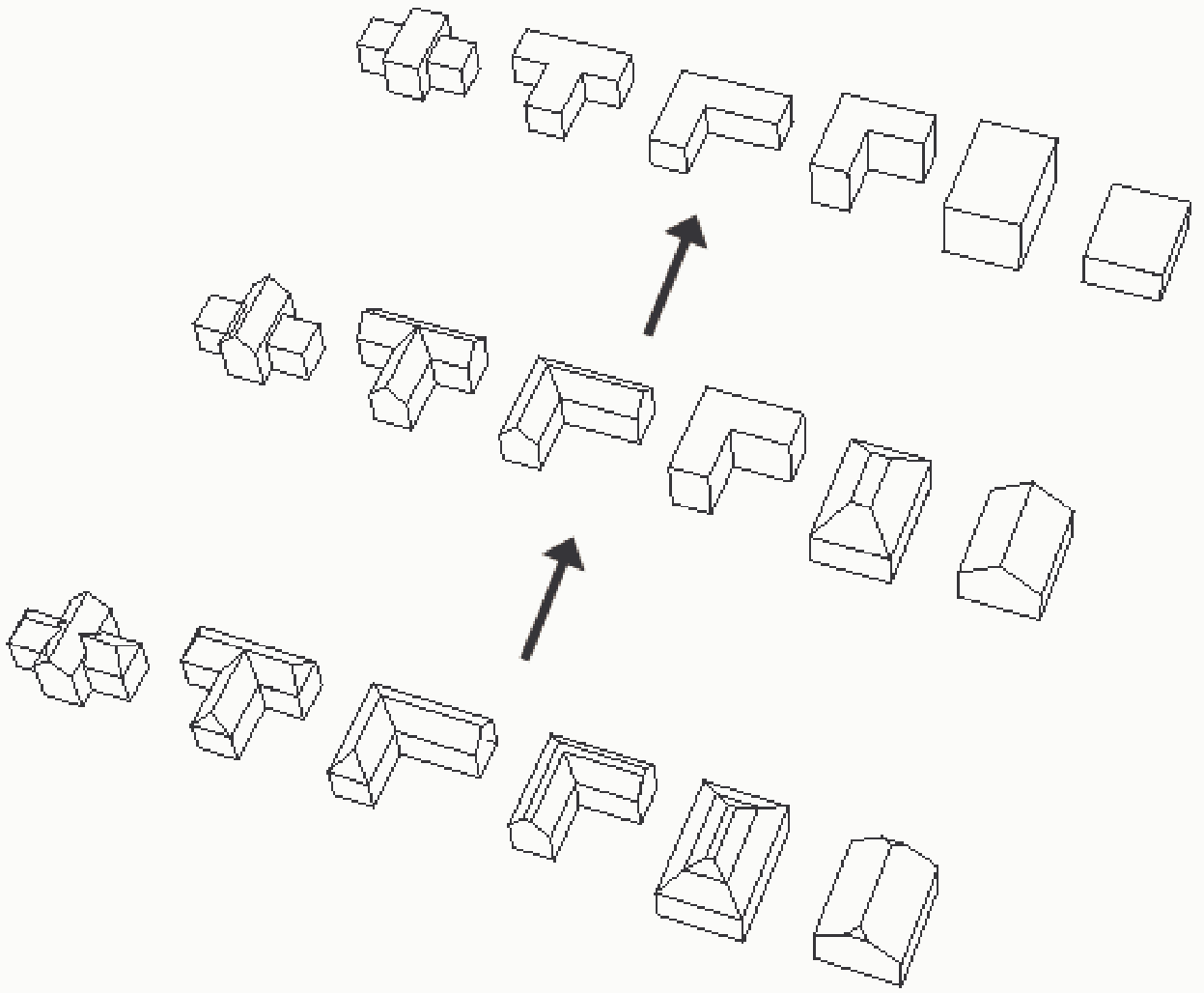
Roof-Squaring

Relations of individual roof-facets to neighbored facets

⇒ Taper-edge and -direction:



Results for Roof-Squaring



Conclusions

Status:

- Simplification of orthogonal structures works for a set of test buildings
- Squaring of roof-structures works for a set of test buildings

To be done:

- Methods and constraints for symmetrie maintenance and height-scaling
- Semantic characterization of buildings ⇔ Determination of parameters for the operations
- Wall-squaring

Problem of Parallel Shift

- Symmetry maintenance not guaranteed