A framework for the representation of two versions of a 3D city model in 4D space

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City Models



Source: Filip Biljecki, 3D Geoinformation (TU Delft)

Level of Detail



Source: Filip Biljecki, 3D Geoinformation (TU Delft)

Obsolete linking mechanism



nD Modelling



Stoter (2010)

nD Data Structures in GIS



Boundary Representation

Topological Representation

Arroyo Ohori et al. (2015a)

Linear Cell Complexes with Combinatorial Maps





2D (Half Edge)

4D (Linear Cell Complex)

Arroyo Ohori et al. (2015a)

Linear Cell Compexes on City Models

Comparison of 3D City Models



Gorszczyk et al. (2016)

Linking LoD Models



Arroyo Ohori et al. (2015b)

Modelling of 4D city models



Example data





Methodology

- (a) Convert 3D city models to LCCs
- (b) Associate objects between LCCs
- (c) Create candidate pairs of darts across LCCs
- (d) Identify corresponding features
- (e) Construct prismatic 3-cells
- (f) Sew common darts across 3-cells

(a) Convert 3D city models to LCCs



Vitalis et al. (2018)

(b) Associate objects between LCCs



Gorszczyk et al. (2016)

(c) Create candidate pairs of darts across LCCs



Gorszczyk et al. (2016)

(d) Identify corresponding features



(e) Construct prismatic 3-cells

Simple linking



Collapse to closest



Topology modification



(f) Sew common darts across 3-cells



Conclusions

Two 3D city models representation in 4D through LCC is possible

Limitations

- Topologically valid input data (non-watertight output)
- The methodology only applies to two datasets

Future work

- Implementation of every step in an automated process
- Incorporation of machine learning instead of heuristics
- Evaluation of the different linking schemes on real-world data

Thank you!