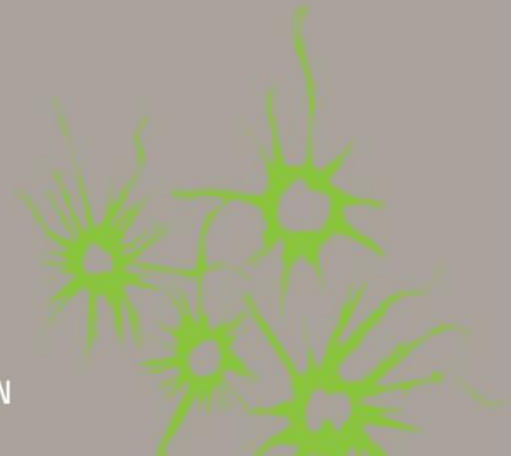
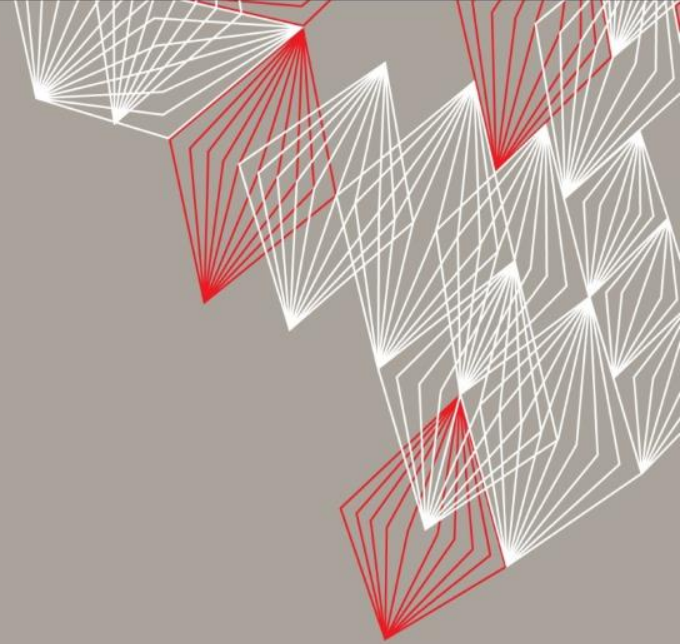


UNIVERSITY OF TWENTE.

**KICK-OFF MEETING SIMS3D
GRAMMAR CONCEPTS**
SEPTEMBER 3RD 2015

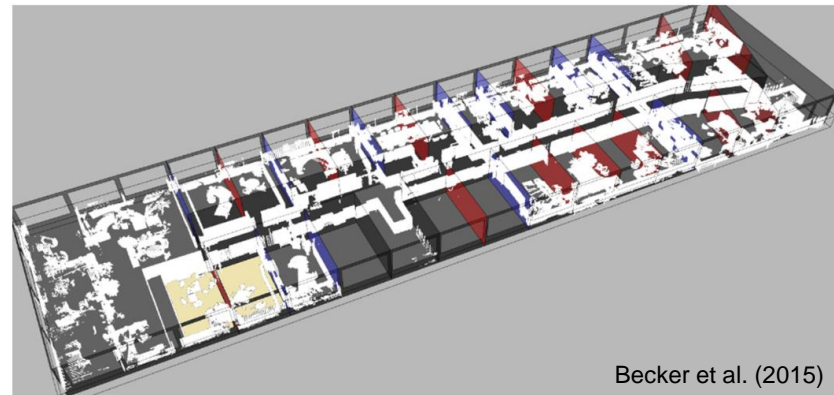
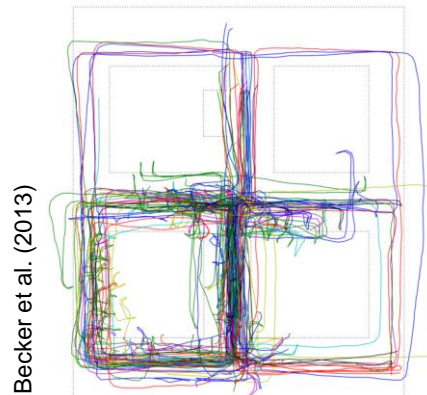


FACULTY OF GEO-INFORMATION SCIENCE AND EARTH OBSERVATION



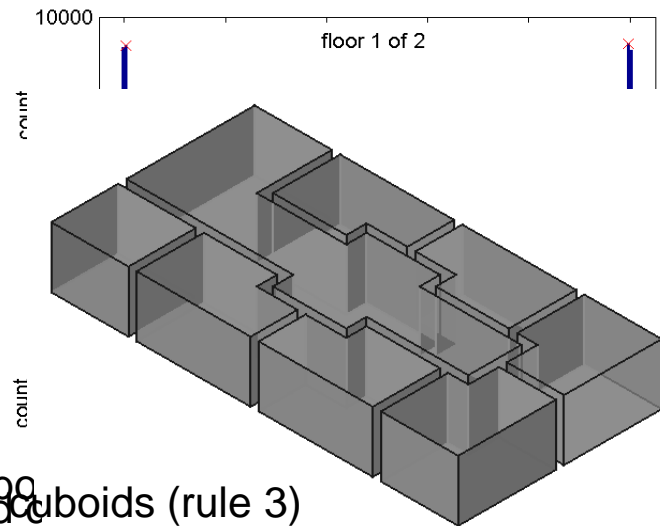
INDOOR GRAMMAR CONCEPTS

- Concepts that allow for reconstruction using data:
 - Khoshelham & Díaz-Vilariño: LiDAR point clouds
 - Becker & Peter: pedestrian traces, LiDAR point clouds, (photographed evacuation plans)



KHOSHELHAM & DÍAZ-VILARIÑO

- Bases on Palladio's concept for interior architecture
- Rules:
 - Translate and scale cuboids according to data
 - Connect neighbouring cuboids
 - Merge connected cuboids



Initial cubo
Connected cuboids (rule 3)

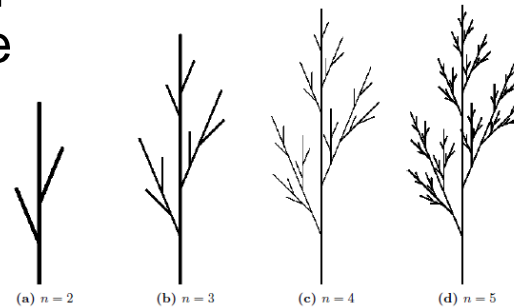


KHOSHELHAM & DÍAZ-VILARIÑO

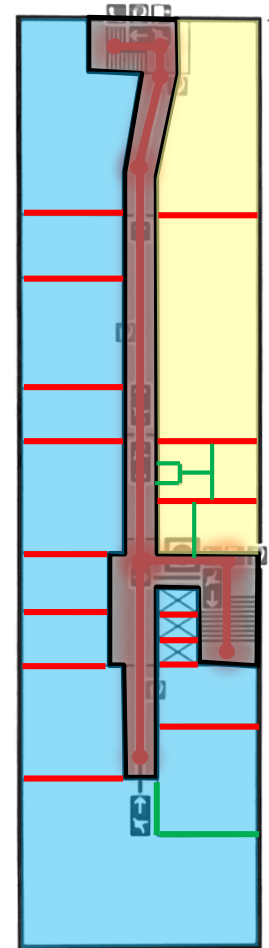
- Pros:
 - Builds on a principle for interior architecture
 - Suitable for reconstruction from fairly complete data
- Cons:
 - Manhattan world
 - Prediction/repeated structures not modelled

BECKER & PETER

- Combination of
 - Lindenmeyer system for corridor structures
 - External shell – corridors = non-corridor space
 - Split grammar for non-corridor spaces
- Rules have probabilities
- Update-and-enhancement-loop: learn and improve grammar using new data, support reconstruction using knowledge already store



<http://people.cs.uct.ac.za/~mdanoher/TreeDrawWebsite/systems.html>





BECKER & PETER

- Pros:
 - Can help to reconstruct areas of poor data quality and/or completeness
 - Contains some semantic information (room, corridor), can be further enhanced
 - Builds on (a few) interior design principles/observations
- Cons:
 - Overhead of two grammars may not be needed for the reconstruction approach using complete data
 - Probability-based grammar concept might not be suitable for reconstructions aiming at emergency use



CONCLUSIONS

- None of the two concepts fits completely
- Grammar to be developed in the project
 - may borrow parts from the existing concepts
 - should be considering evacuation route planning



REFERENCES

- Becker, S., M. Peter, D. Fritsch, D. Philipp, P. Baier, and C. Dibak. “Combined Grammar for the Modeling of Building Interiors.” In *ISPRS Acquisition and Modelling of Indoor and Enclosed Environments 2013 (Indoor 3D)*, 2013.
- Becker, S., M. Peter, and D. Fritsch. “Grammar-Supported 3D Indoor Reconstruction from Point Clouds for ‘as-Built’ BIM.” In *Proceedings of the 2015 Conference on Photogrammetric Image Analysis (PIA2015)*. Munich, Germany, 2015.
- Khoshelham, K., and L. Díaz-Vilariño. “3D Modelling of Interior Spaces: Learning the Language of Indoor Architecture.” *ISPRS-International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences XL*, no. 5 (2014): 321–26.