A Sweep-Plane Algorithm for the Simplification of 3D Building Models in the Application of Wind Simulation

3D Geoinfo Conference 2018
02.10.2018

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Creating the computational domain for CFD

Building with terrain

Create a box around the building(s)

The interior of the box represents the air and is filled with a spatial mesh
i_city : Intelligente Stadt

Source: STUTTGART
The Sweep-Plane Algorithm
Sweep of a face along its normal (red). The Vertices are moved along edges (green).

Merging of coplanar faces.

DeSweep of the merged faces.

Simplified Building model in comparison to the original one.
Vertex can be moved along two edges

Splitting of the Vertex and a new creating of a new edge

Building model after the sweep

Simplified building model after desweep in comparison to the original one.
Results
3-5 m edge length

Inflation layer with suitable skewness
Conclusion

• CityGML can be translated into the CAD world, but cityGML models contain too many details for CFD simulations on larger areas. Therefore the models have to be simplified.

• The Sweep-Plane algorithm is a good starting point for the automated processing of 3D city models.

• The presented algorithm alone is not enough to fully process the models for CFD simulations.
Thank You for Your Attention!

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