Automatic space subdivision for multi-story pathfinding on a 3D point cloud using an octree

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MSc Thesis Geomatics
• Acquiring **point clouds** of indoor spaces became increasingly easy & cheap
  – Unstructured
  – Pathfinding (*Indoor Navigation*) requires additional information
Problem statement

There is no way to **automatically derive** a subdivided **model suitable for pathfinding**, while at the same time keep the **multi-floor connectivity via stairs**.
Research question

To what extent can an **octree data structure** be used to **subdivide 3D space** and to create a model for multi-story pathfinding?
ZEB1 point cloud *Fire Brigade in Berkel en Rodenrijs*
Octree data structure

http://2.bp.blogspot.com/_kvCpVC7wnSs/TOr_DsGqO0I/AAAAAAAAe4/zYF4UssOk0o/s1600/octree.png
Subdivision & semantic enrichment

- Floor*
- Stairs*
- Empty space
- Walls *
- Obstacles (furniture)*
Subdivision & semantic enrichment

Okorn et al. (2010) & Khoselham et al. (2014)
Subdivision & semantic enrichment
Wall detection

Okorn et al. (2010) & Oesau et al. (2014)
2D histograms & slope to find stairs

1. plane fitting
2. filter plane direction
3. region growing

Bansal et al. (2011)
First results
First results
Next: pathfinding
Next: pathfinding
Next: pathfinding

- complete subdivision

- Derive possible path for humans
References


Questions?