

The logo for SIMs3D features a stylized 3D architectural model of a building with various colored surfaces (blue, green, red) and a white grid pattern. The text 'SIMs3D' is overlaid in white.

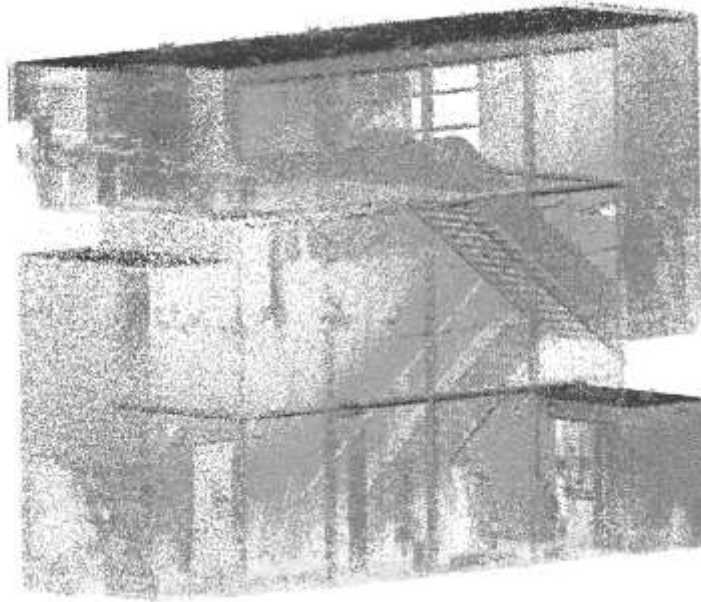
SIMs3D

Smart 3D indoor models to support crisis management in large public buildings

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

F.W. Fichtner, 2016-03-15

MSc Thesis Geomatics



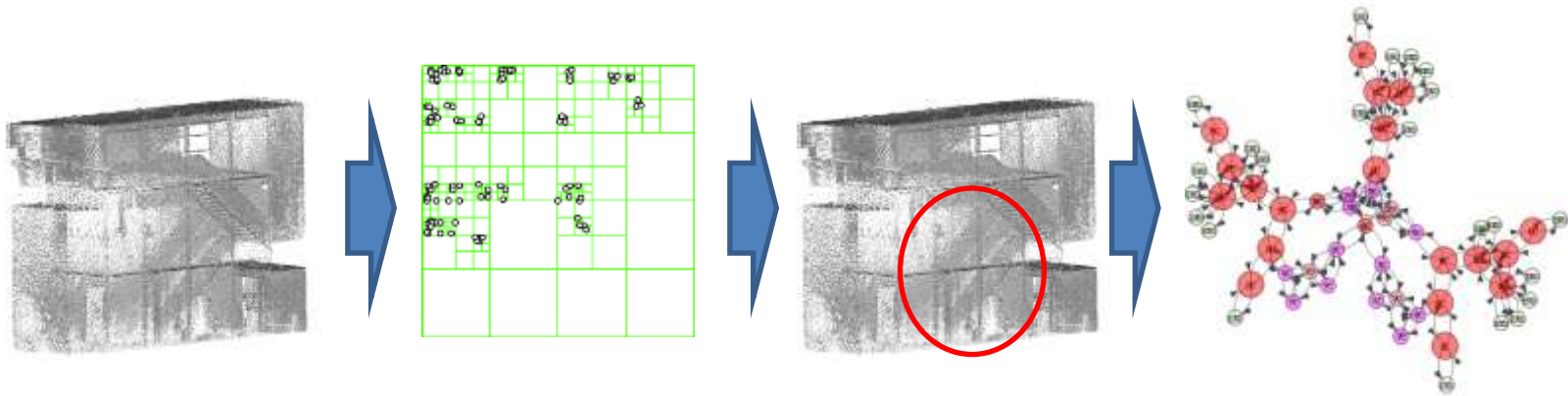
- Acquiring **point clouds** of indoor spaces became increasingly easy & cheap
 - Unstructured
 - Pathfinding (*Indoor Navigation*) requires additional information

Problem statement

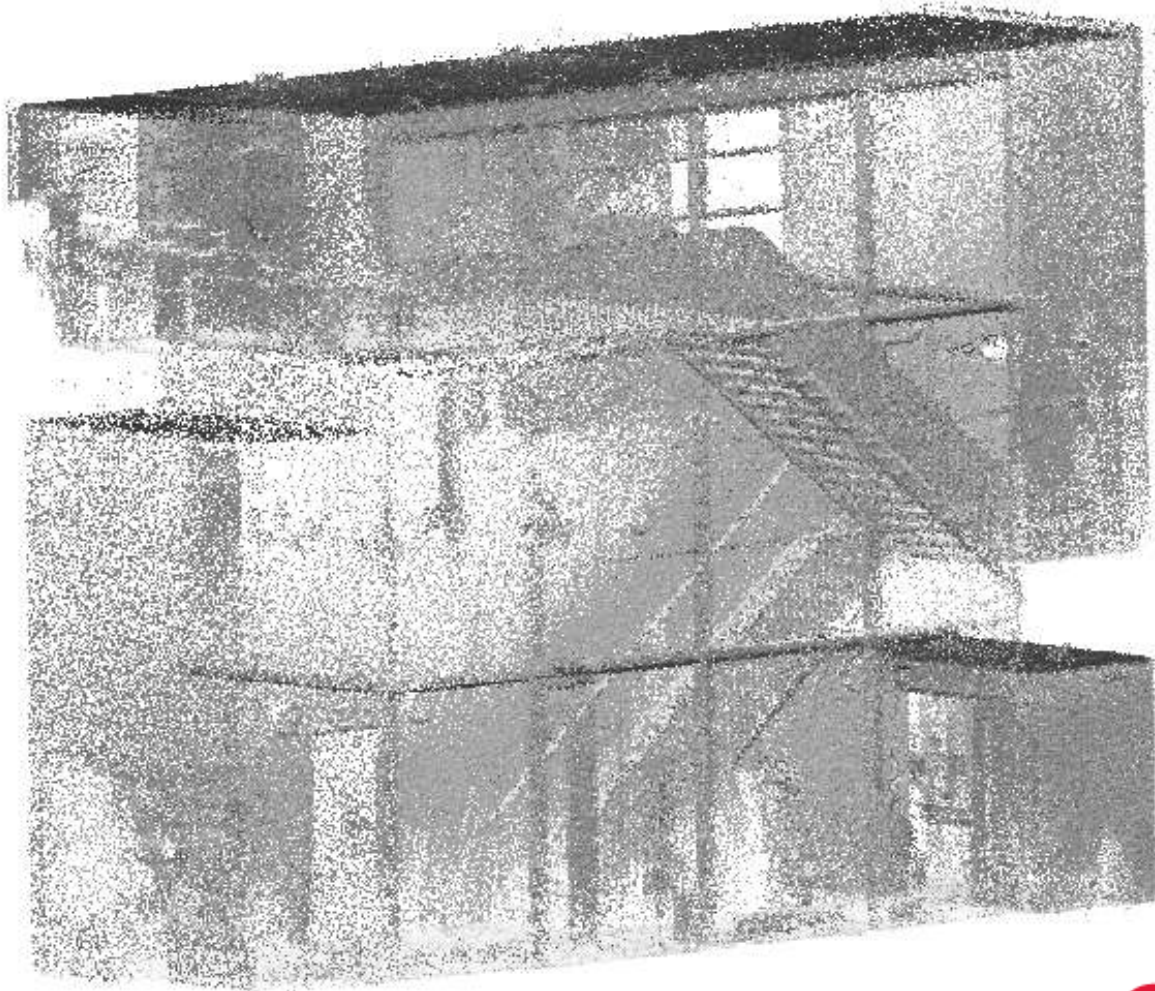
*There is no way to **automatically derive a subdivided model suitable for pathfinding**, while at the same time keep the **multi-floor connectivity via stairs**.*

Research question

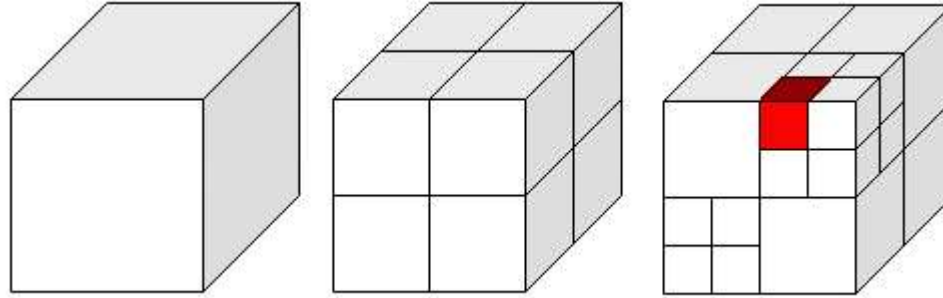
To what extent can an **octree data structure** be used to **subdivide 3D space** and to create a **model for multi-story pathfinding**?



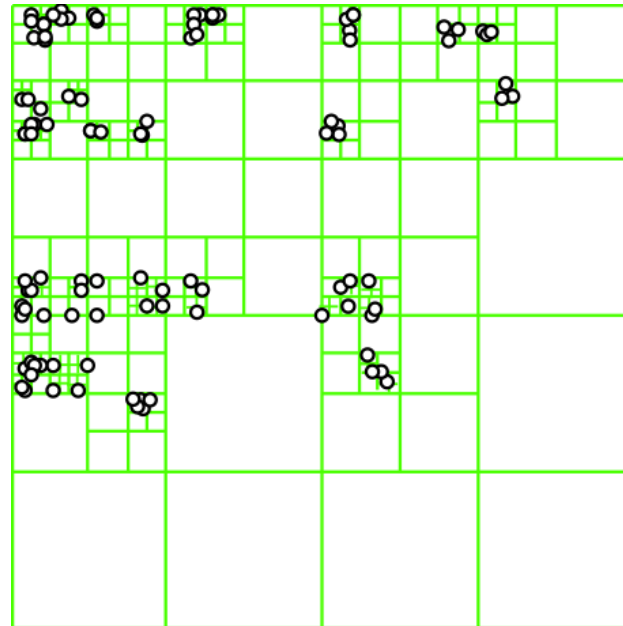
ZEB1 point cloud *Fire Brigade in Berkel en Rodenrijs*



Octree data structure



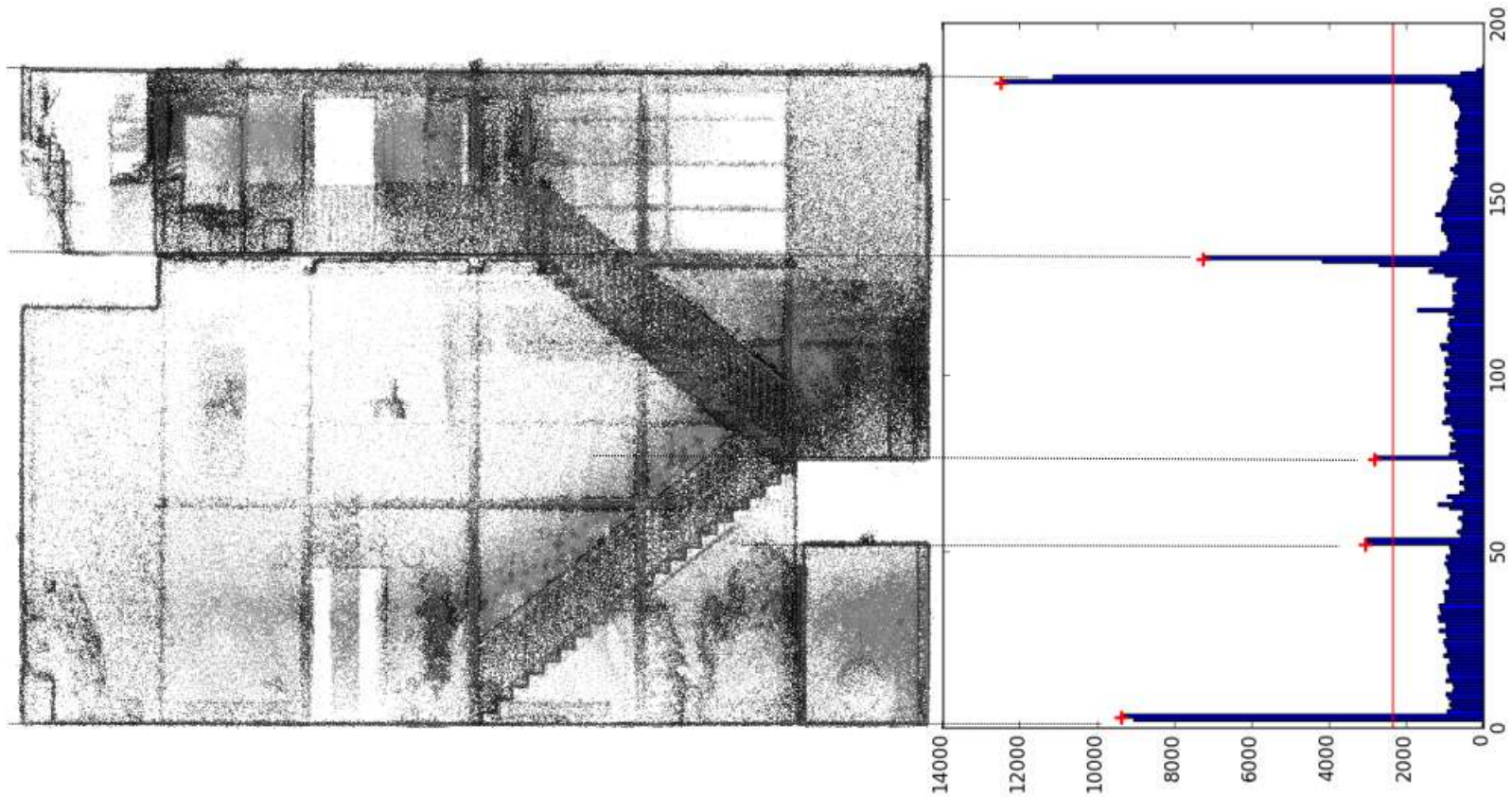
http://2.bp.blogspot.com/_kvCpVC7wn5s/TOr_DsGqO0I/AAAAAAAAAe4/zYF4UssOk0o/s1600/octree.png



Subdivision & semantic enrichment

- Floor*
 - Stairs*
 - Empty space
- } walkable space
- Walls *
 - Obstacles (furniture)*

Subdivision & semantic enrichment

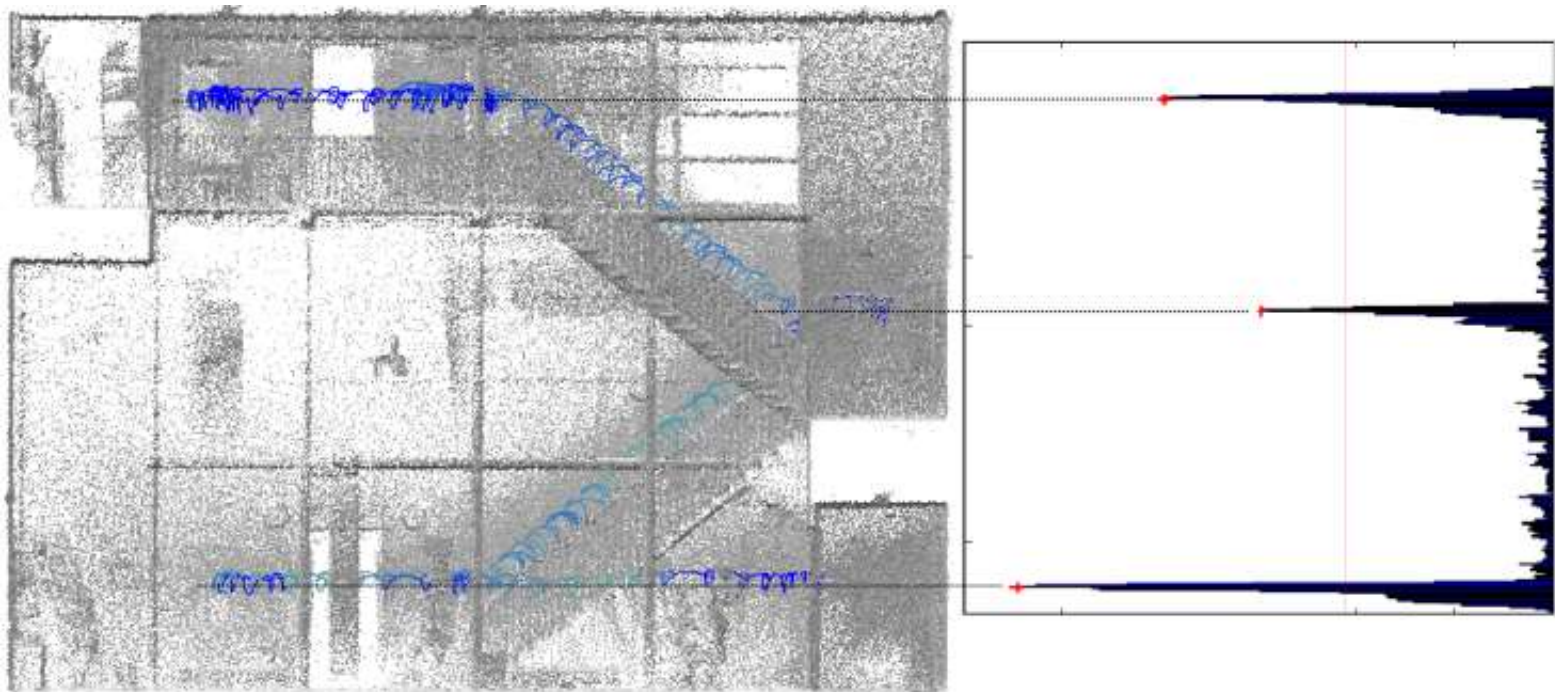


Okorn et al. (2010) & Khoselham et al. (2014)

CGI



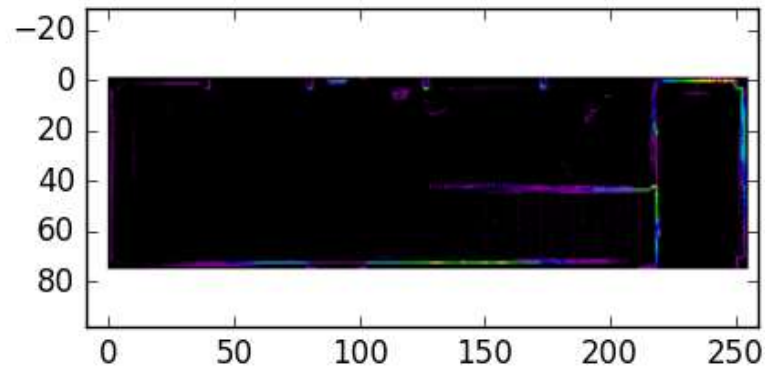
Subdivision & semantic enrichment



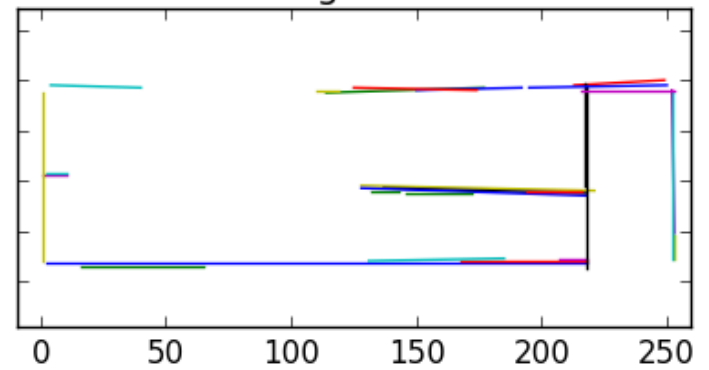
Wall detection



vert hist



hough lines

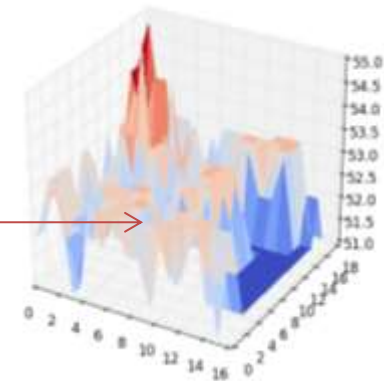
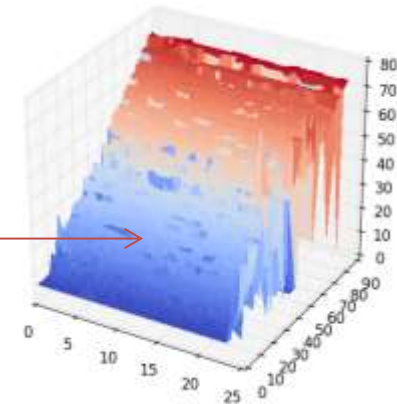
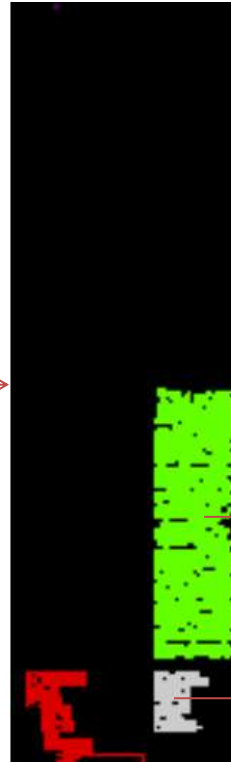


Okorn et al. (2010) & Oesau et al. (2014)

2D histograms & slope to find stairs

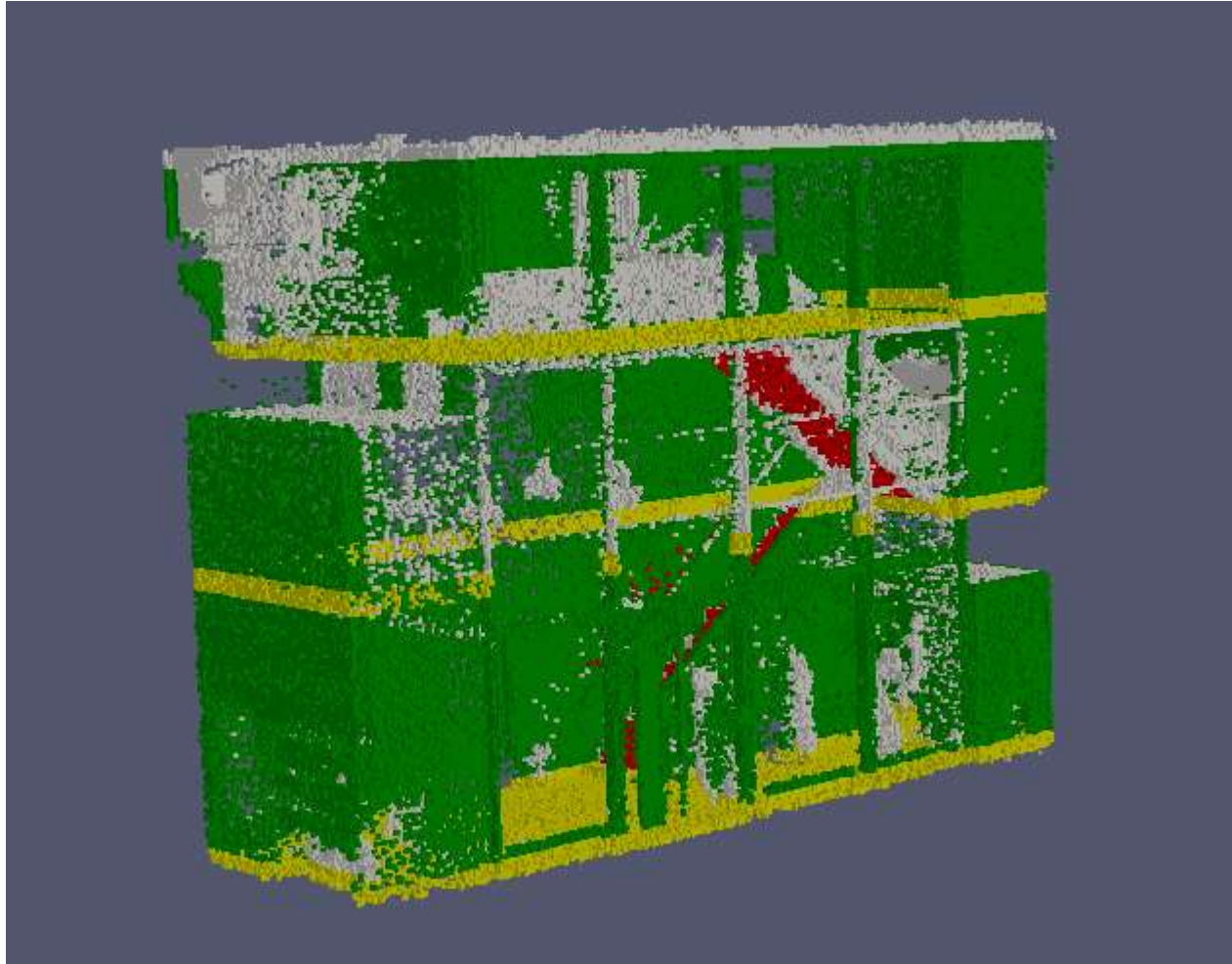


1. plane fitting
2. filter plane direction
3. region growing

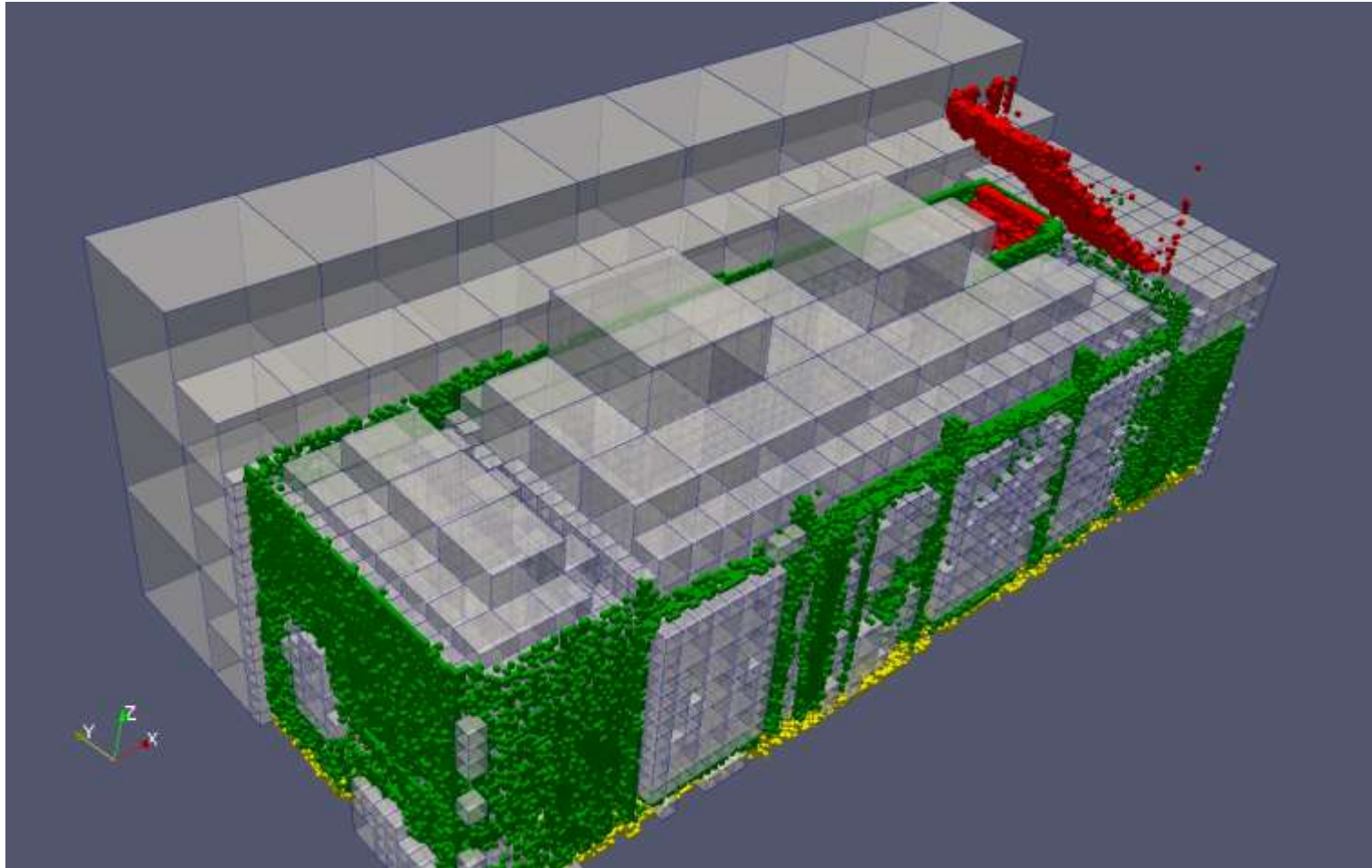


Bansal et al. (2011)

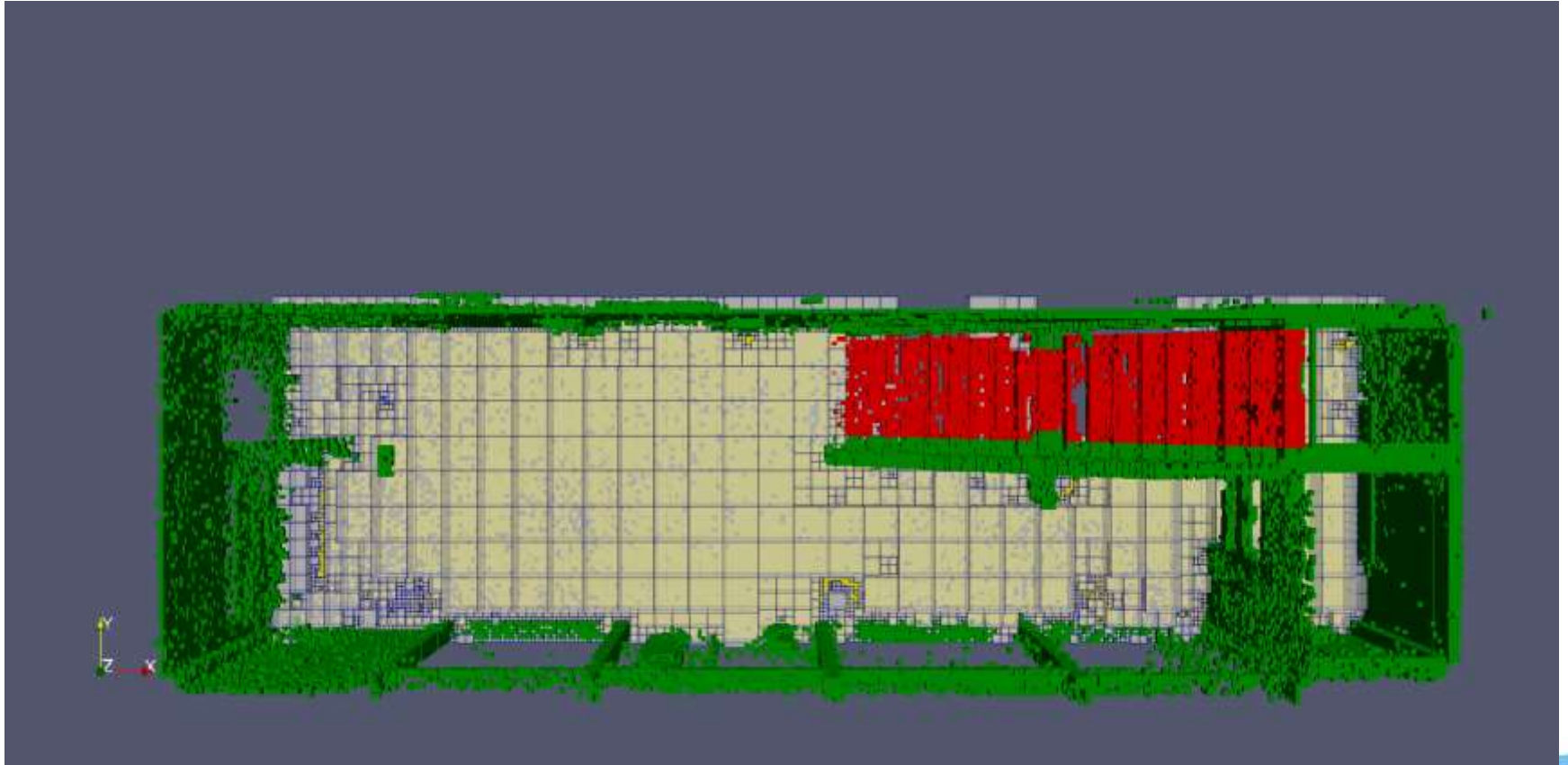
First results



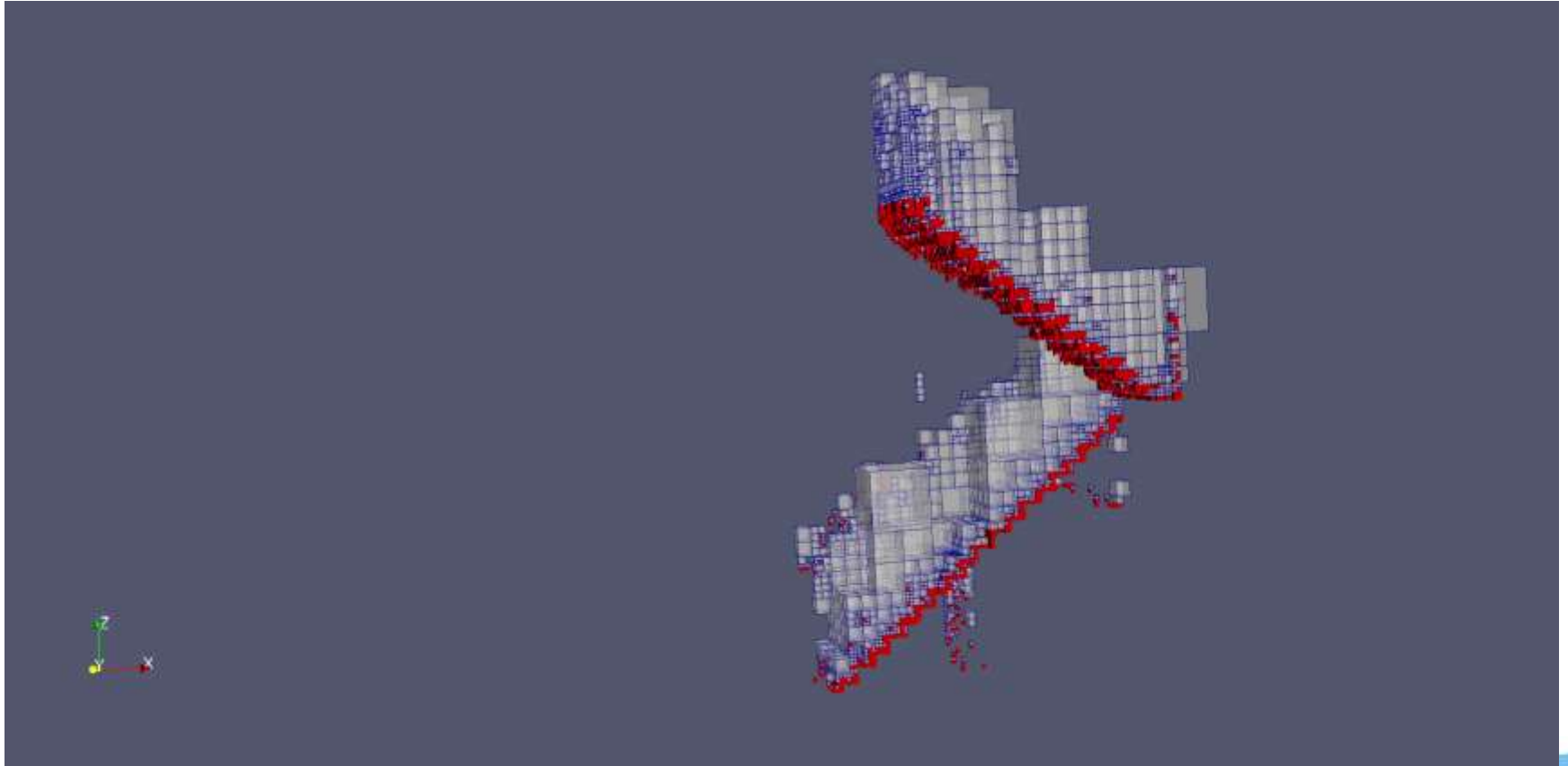
First results



Next: pathfinding

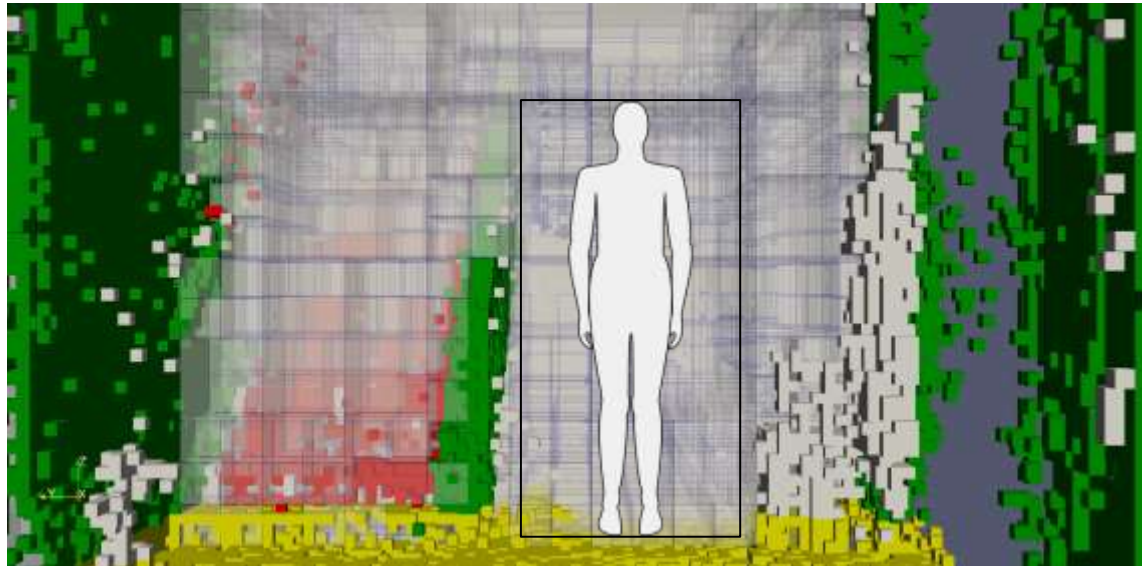


Next: pathfinding



Next: pathfinding

- complete subdivision



- Derive possible path for humans

References

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Questions?