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

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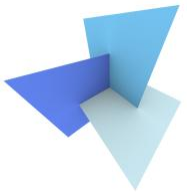
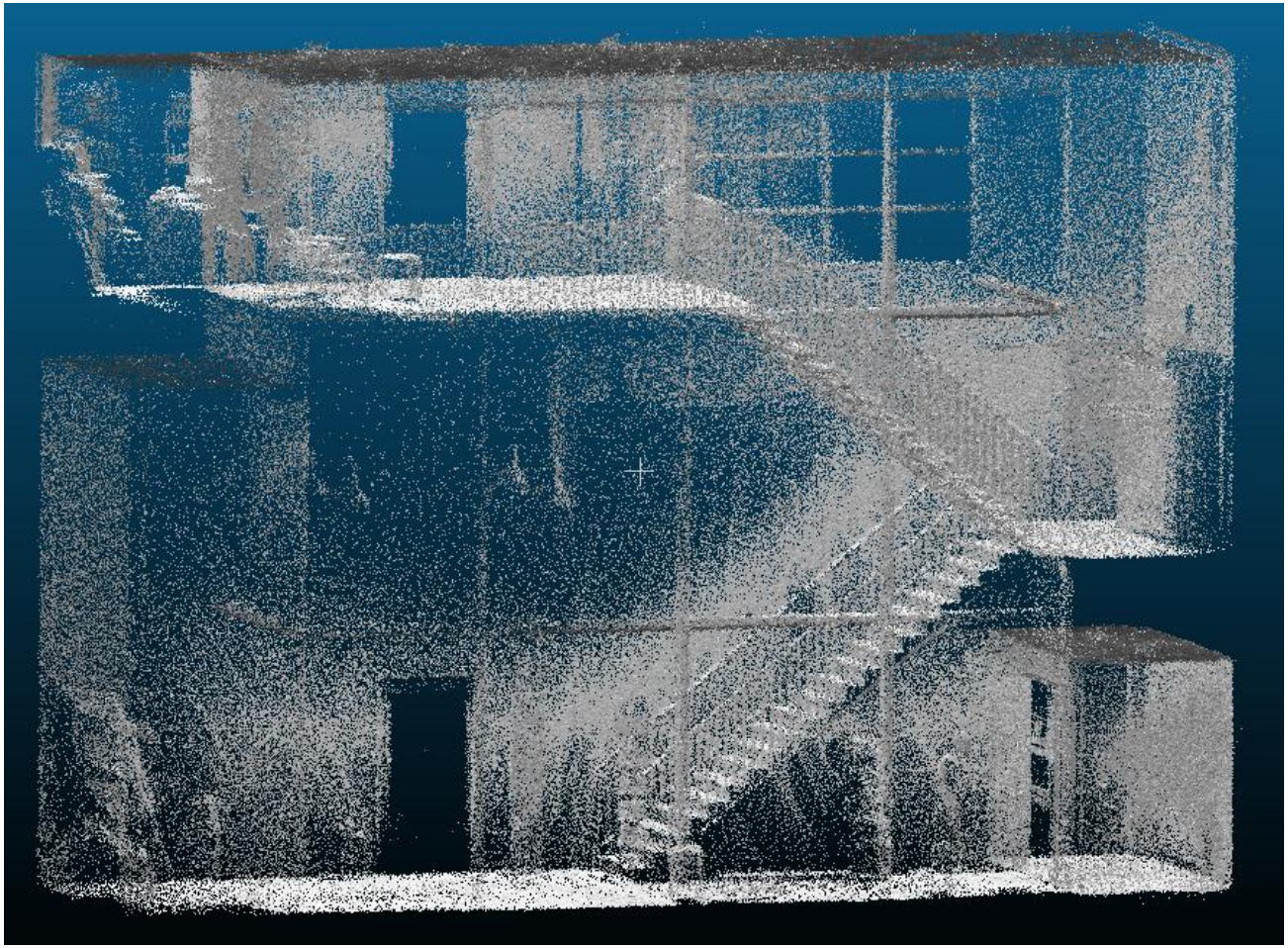
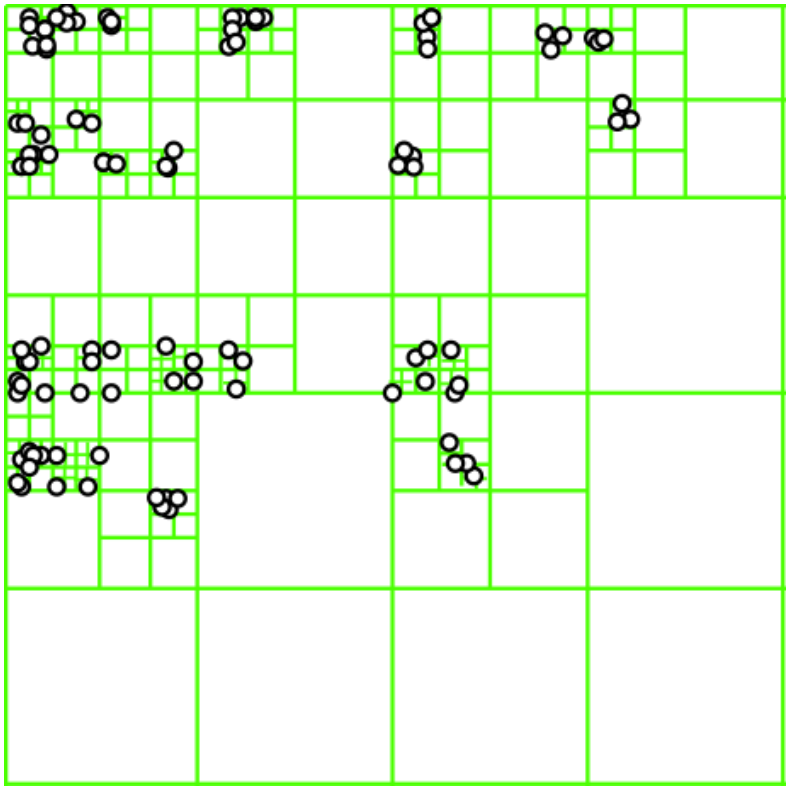


ZEB1 point cloud *Fire Brigade in Berkel en Rodenrijs*



Octree



Reconstruction for pathfinding

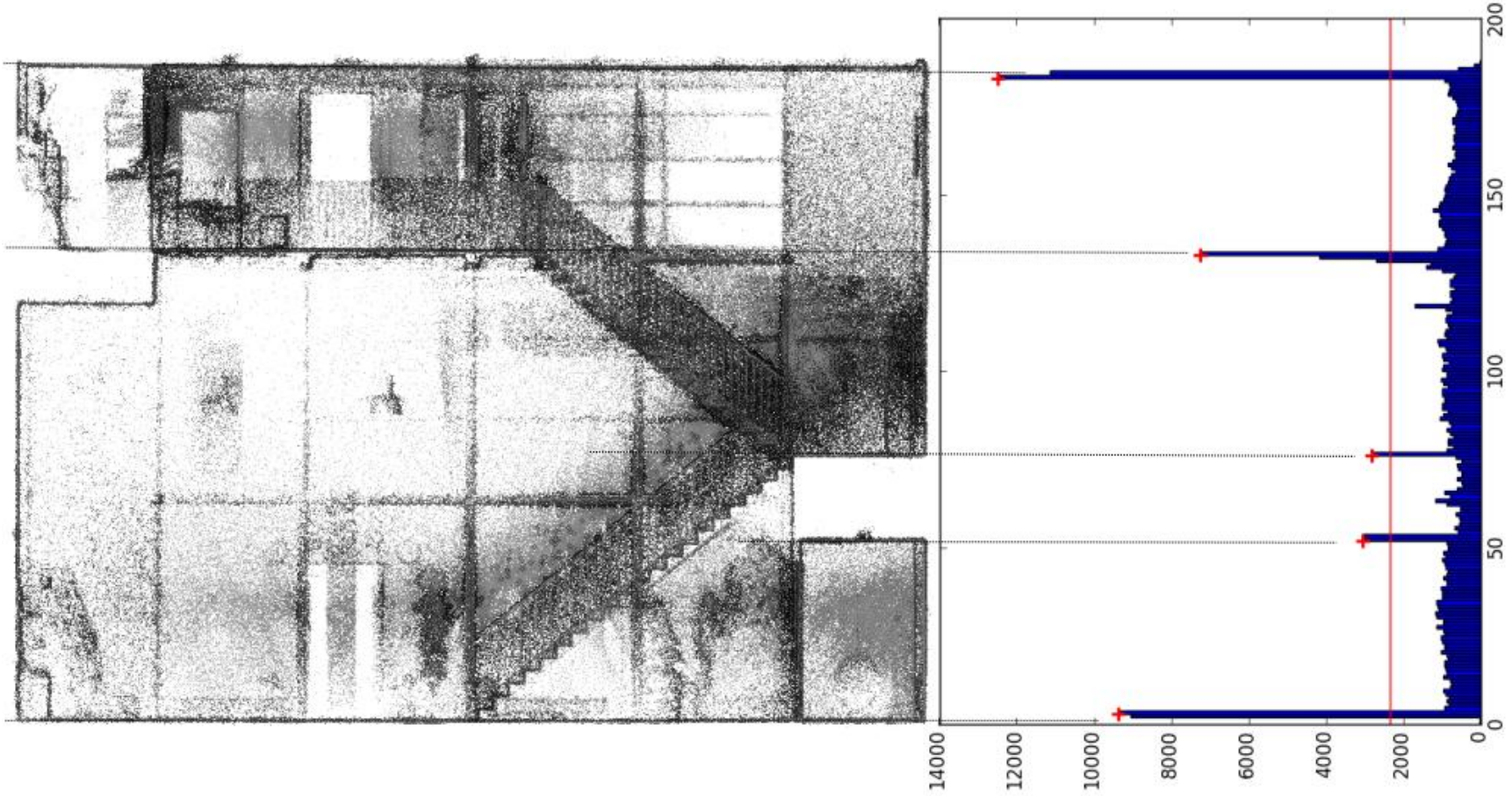
1. Subdivide and semantically enrich the structure
2. Derive pathfinding network

3. Match model with localizer

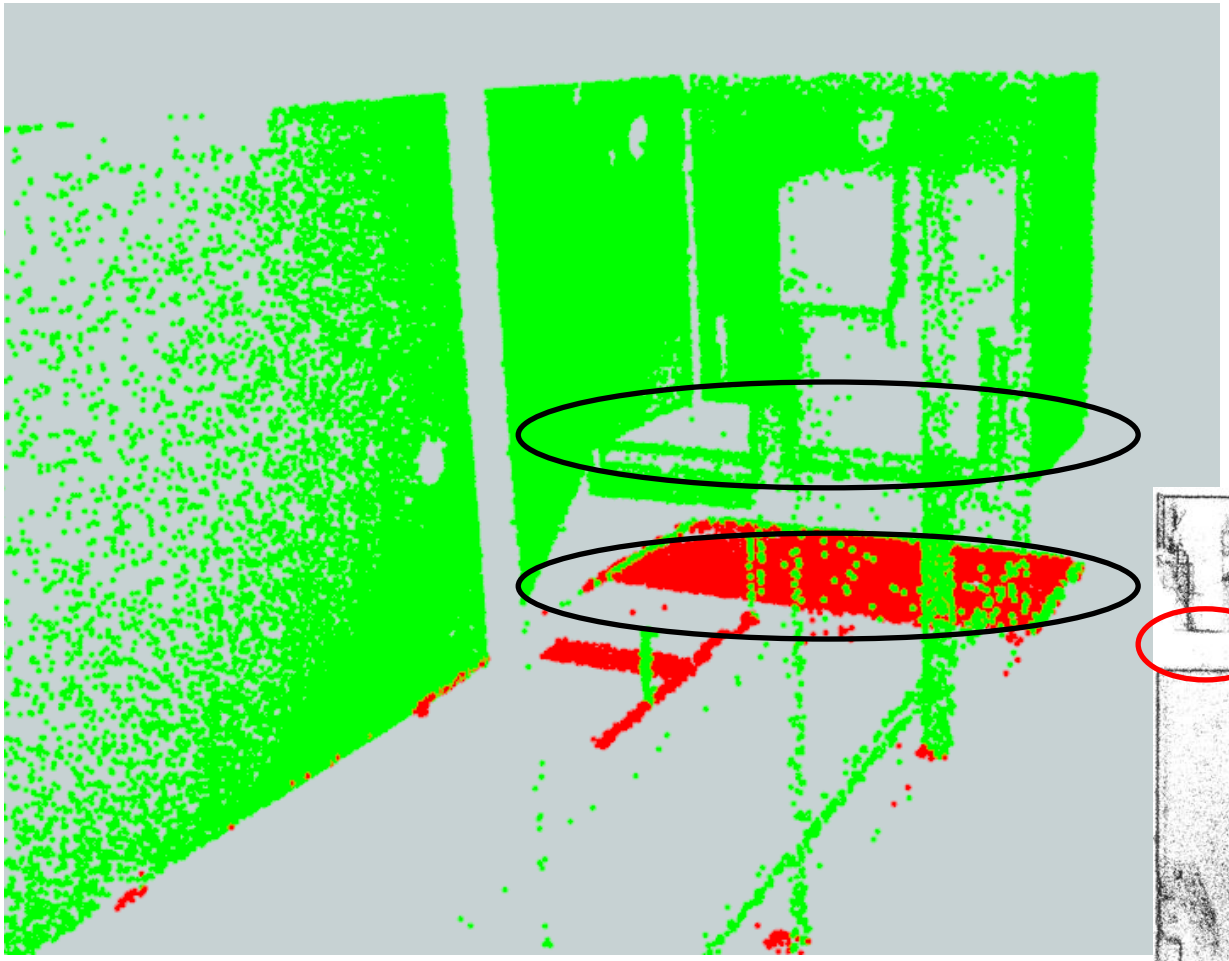
How to?

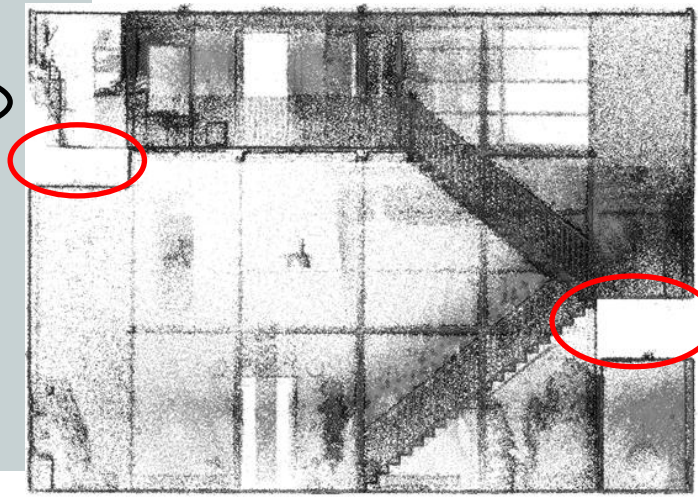
- Histograms
- Plane fitting
- Line detection

Story separation



First story, problem hanging ceilings



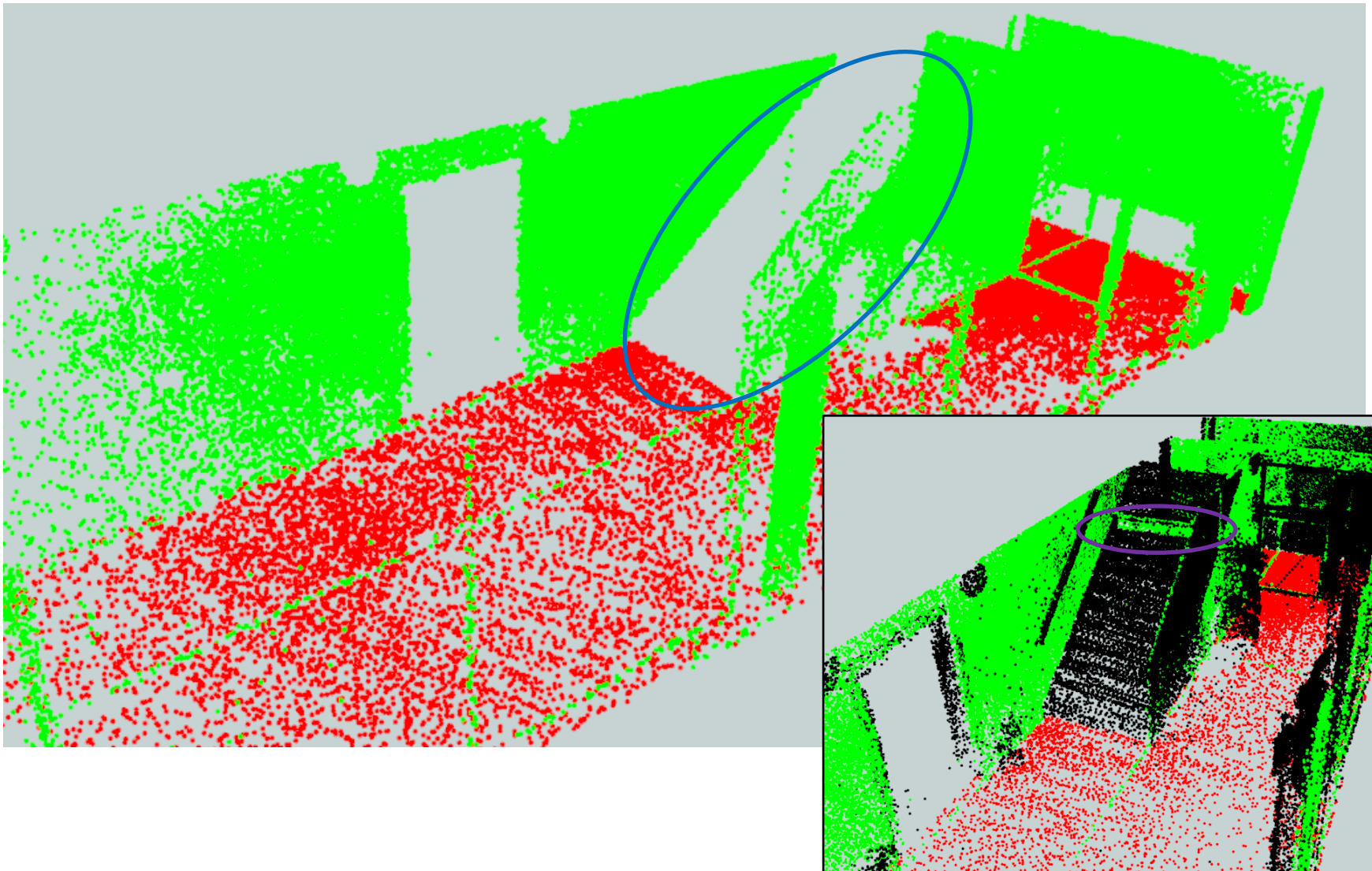


But what if there would be a table?

- Histogram would have the same peak attributes

- To be fixed when stairs are known?

Ground story



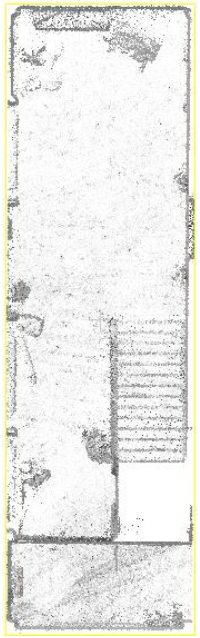
Vertical & Horizontal histograms

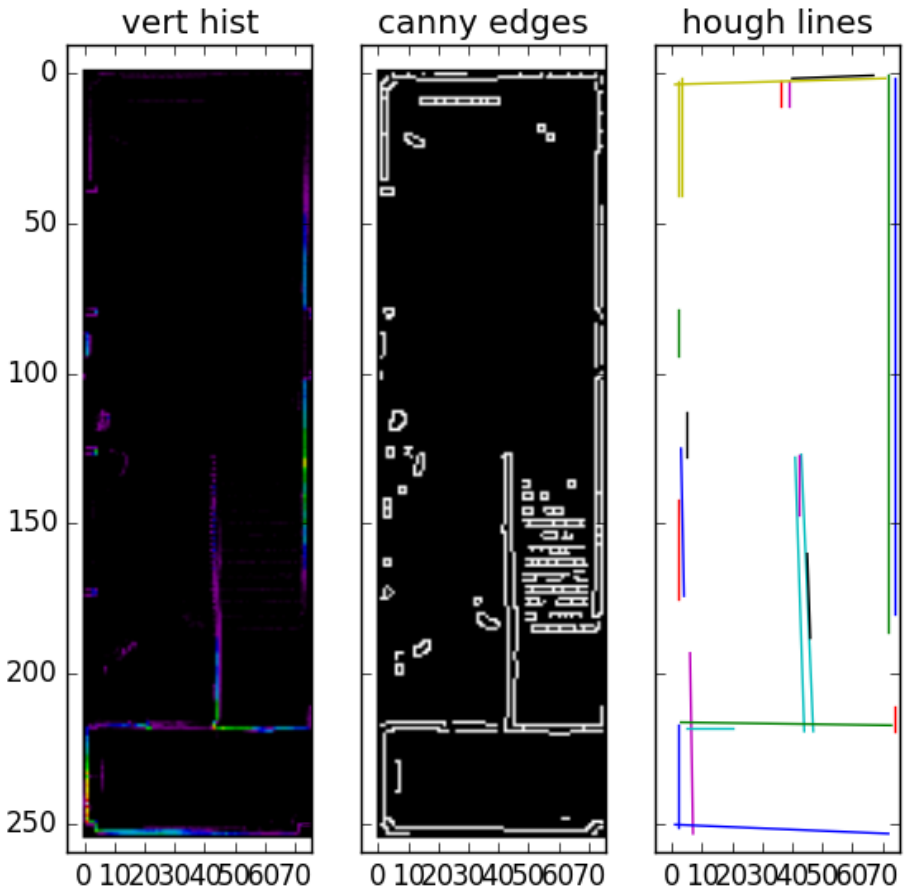
- According to normal direction of plane through points in octree leaf and direct neighbours

Improve wall detection

- Hough transform

point cloud cut floor 0



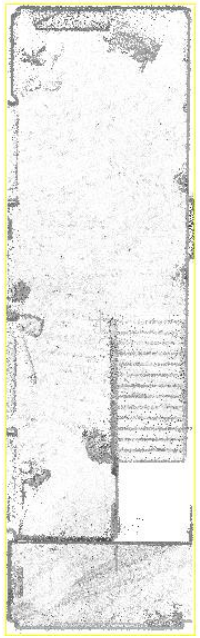


Next: project to octree, correct result of histogram method

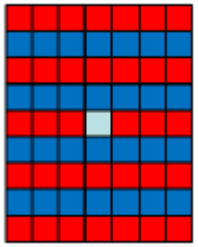
Stairs

- Matched filter for vertical & horizontal histogram

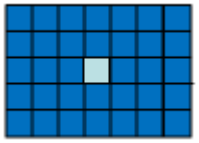
point cloud cut floor 0



stair vertical filter



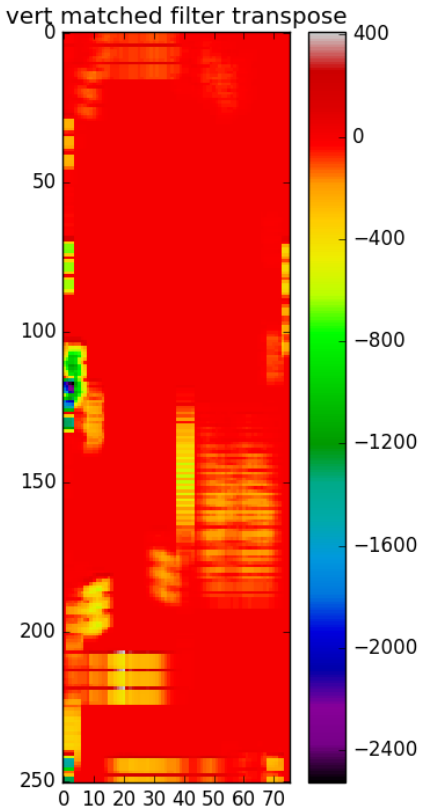
stair horizontal filter

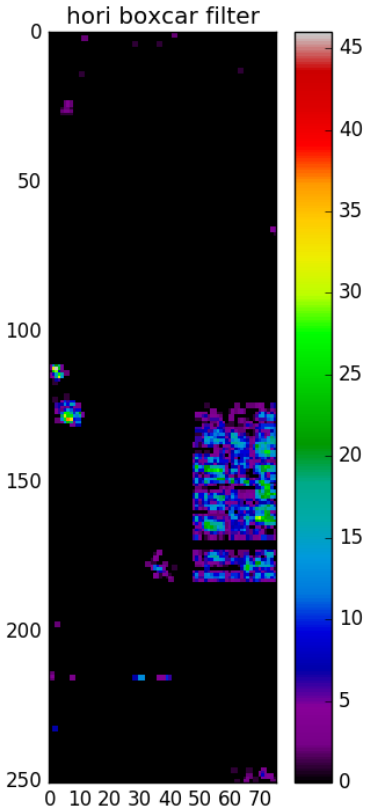


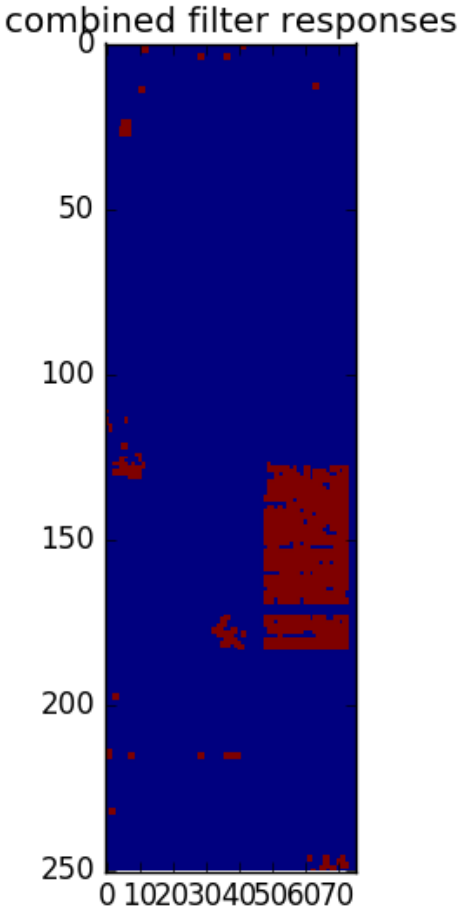
Blue=positive filter weights
Red=negative filter weights
Light blue=centre of filter

Stairs

- Filter responses







Next: grow regions calculate slope & aspect, should link two floors

Tools

- SciPy (NumPy, Matplotlib, Scikit-image)
- PostgreSQL
- CloudCompare
- FME Workbench

References

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