Insight through explorative point clouds
Connecting indoor and outdoor

Geomatics Synthesis Project 2015-Q1

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Management of Massive Point Cloud Data
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Technische Universiteit Delft

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  - Pointless

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  - XYZ

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  - OWL

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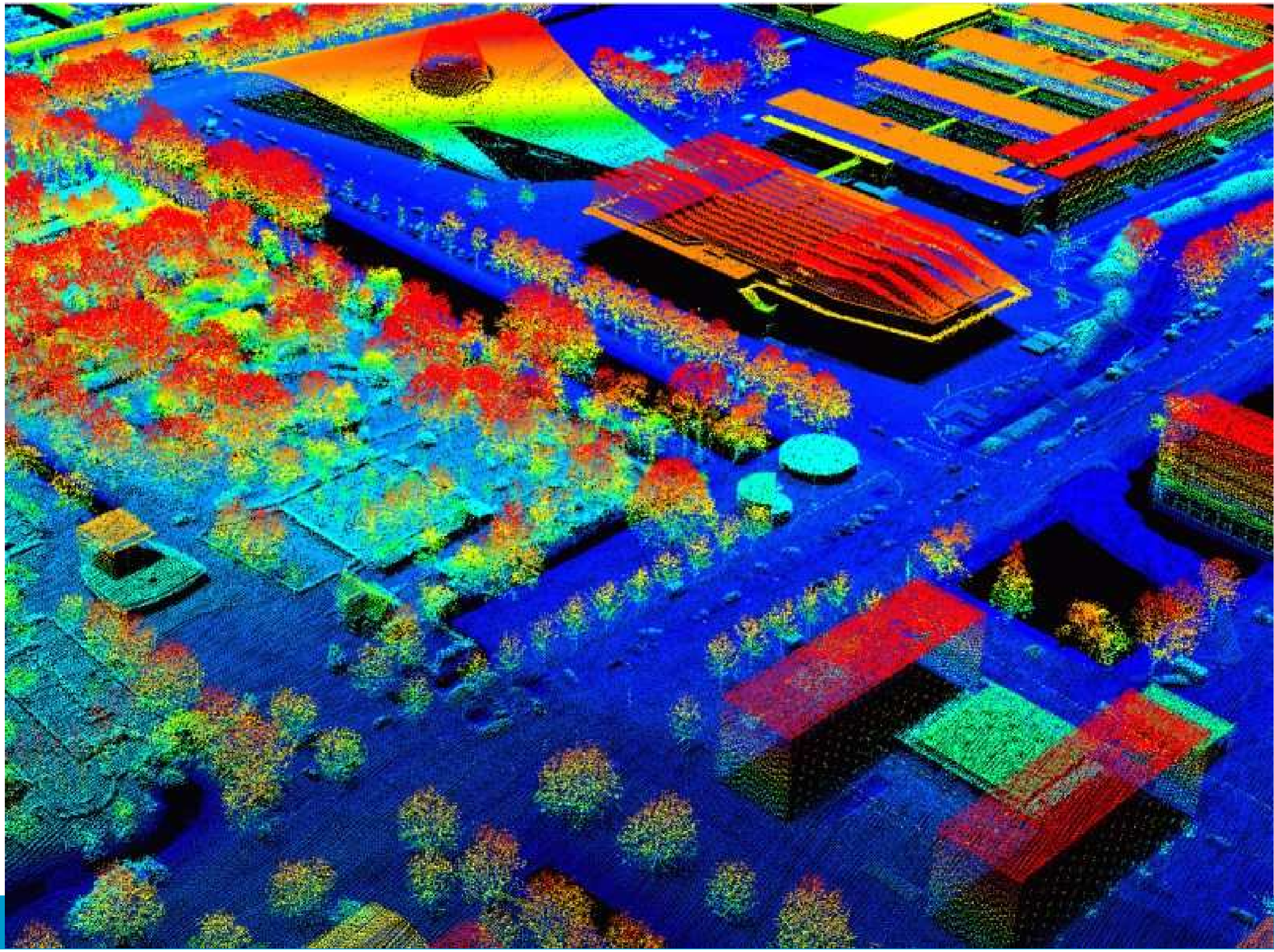
Technology that shapes our society



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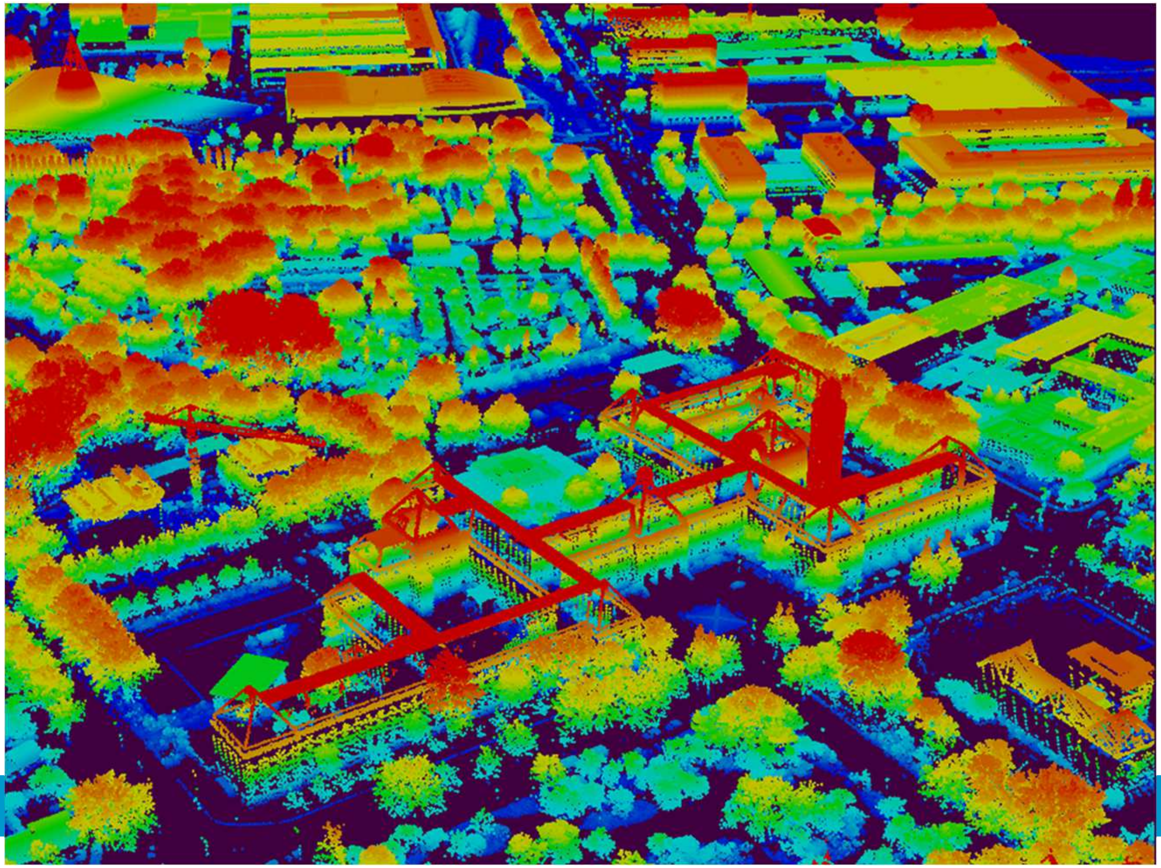
Key-Example: AHN2
'Actual' Height Model of The Netherlands



Modelling the World in 3D: Processing takes throughput time

- Example: 3D TOP10NL of the Netherlands
  - 650.000.000.000 AHN2 height points (2008-2011)
  - 15.000.000 TOP10NL objects (2012-2014)
- Fast processing by some super computing power
  - Not an Actual 3D Model
  - Semantically processed and enriched AHN2 point cloud
    - (Sander Oude Elberink)

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Potential of Point Cloud Data

The world is its own best model.
It is always exactly up to date.
It always has every detail there is to be known.
The trick is to sense it appropriately and often enough.

- Rodney Brooks, 1990, Elephants don’t play chess

Potential of Point Cloud Data

- Decision making processes
- Many expert-users from different professions
- Strong urge to access the original measured data
- Interactive visualisation tools
- Visual interaction

“Every time I walked through I found something I have not seen before.”

- Curator David Rooney
- Science Museum - The Shipping Galleries 3D Model

http://youtu.be/gDTbFhFZl9I

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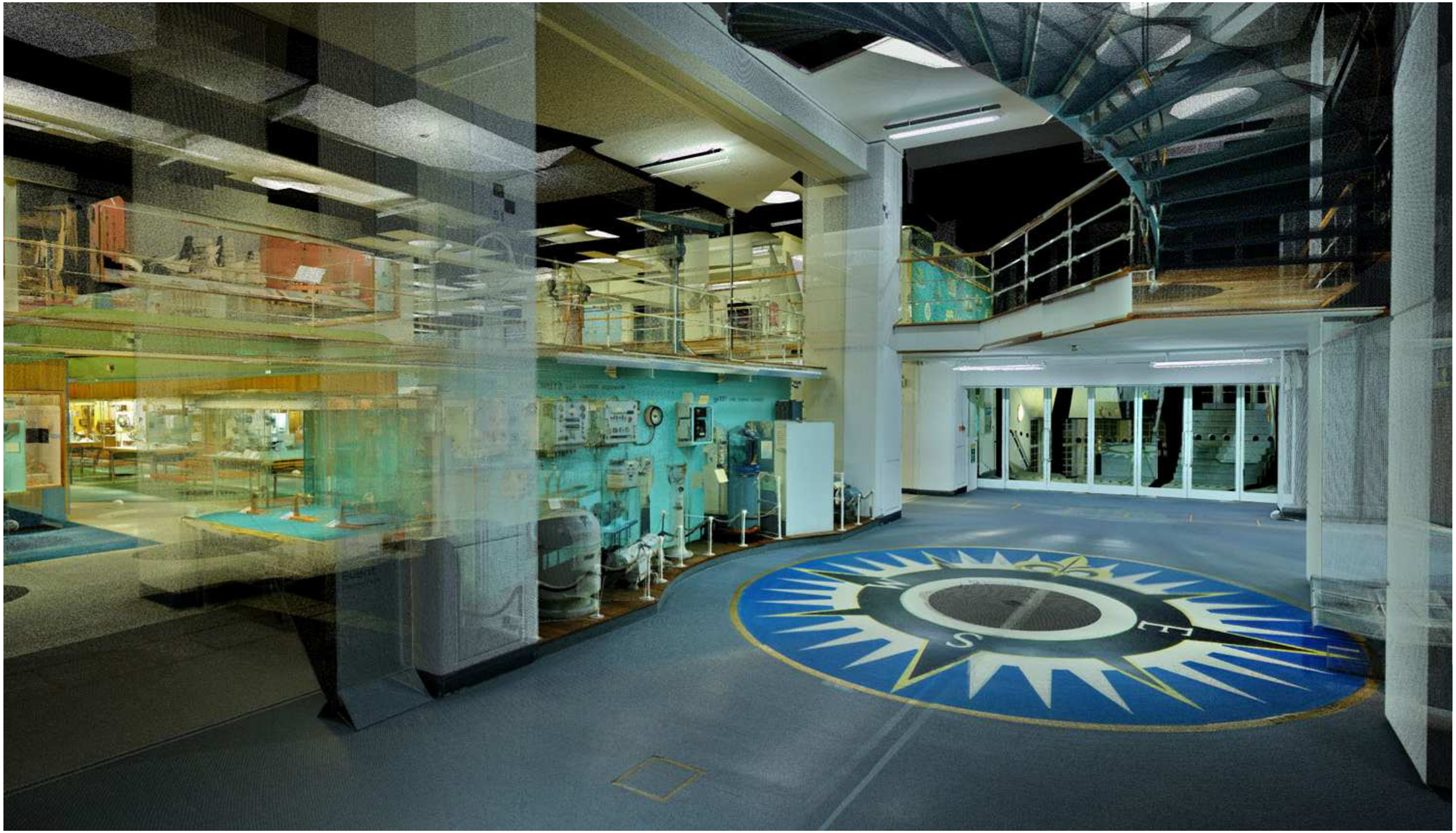
Science Museum

Science Museum



Explorative Point Clouds
Research questions

- How do we store and transmit point cloud data to non-specialist users;
- How can we provide interactive visualisation tools, such that point clouds appear for the society (end users) as a virtual world, rather than technical sensor output;
- How can we provide point cloud analysis tools, such as object reconstruction, profiling and change detection;
- What kind of explorative spatial data analysis tools should be available to support domain-experts in extracting semantic information from the point clouds attribute values.

Vision: Explorative Point Clouds

Point Clouds for immediate use and analysis

- Direct Human Interpretation
- Visualisation tools and techniques: Smart Mapping / Cartography
- Interactive cartography and geo-visualisation: interaction and interfaces

- Direct Tools to identify, measure, process, and analyse
- Visibility analytics: line of sight
- Measurement tools: length, area, and volume calculations
- Analysis tools: path-planning
- Explorative Spatial Data Analysis tools: histograms, distributions, trends

Syntheses project
Goals (8 weeks)

- A synopsis of the different disciplines
- Practice teamwork in small groups
- Experience the **entire geo-information process**
  - From project definition, over measurement (data gathering), data processing and analysis, to presentation and delivery, and application.
- Encourage collaboration between students and staff of the groups involved

Syntheses Project
Point cloud key-examples

- Pointless
  - Terrestrial / Indoor: Leap3D (Zeb1)
  - Processed directly to obtain navigable space
- XYZ
  - Mobile: Cyclomedia
  - Processed directly to segment and classify objects
- OWL
  - Airborne / Drone: Skeye
  - Processed directly to link dense matched points to images

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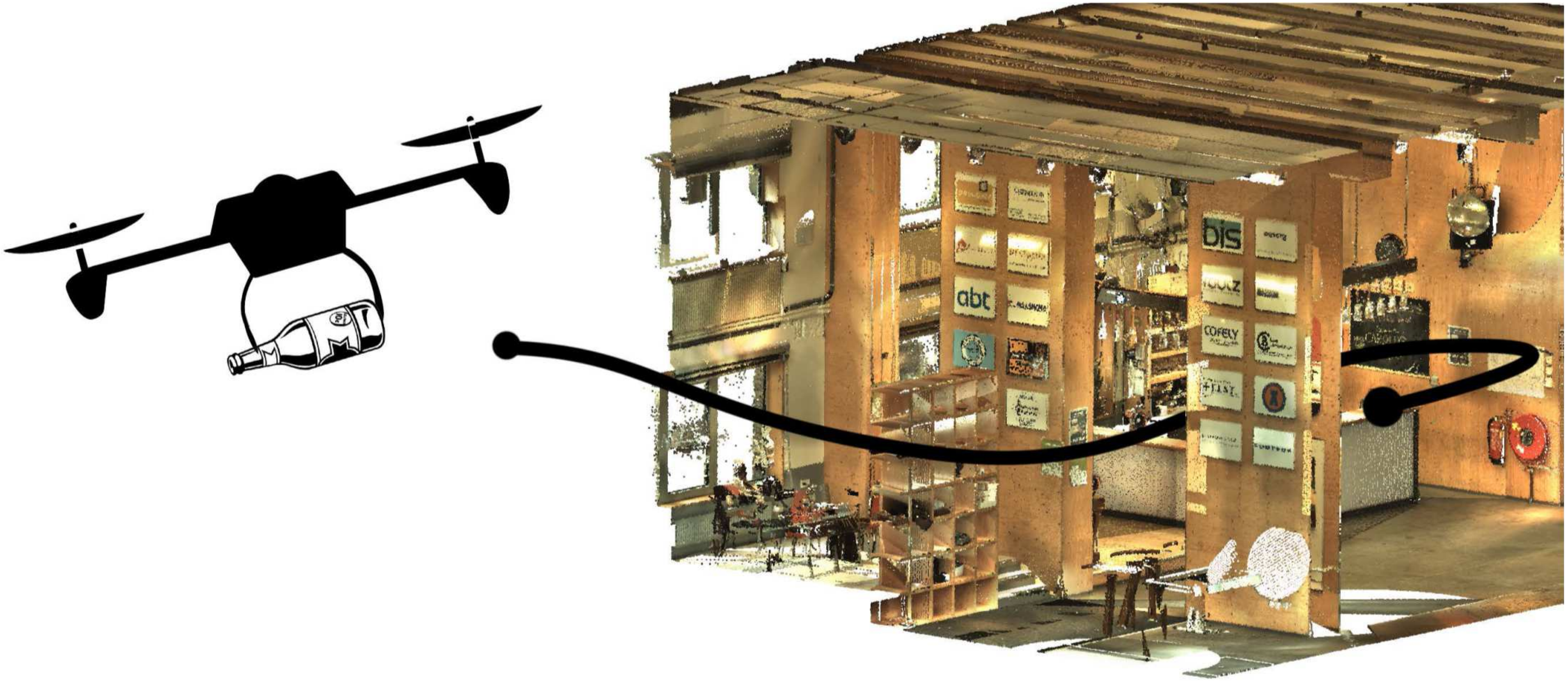
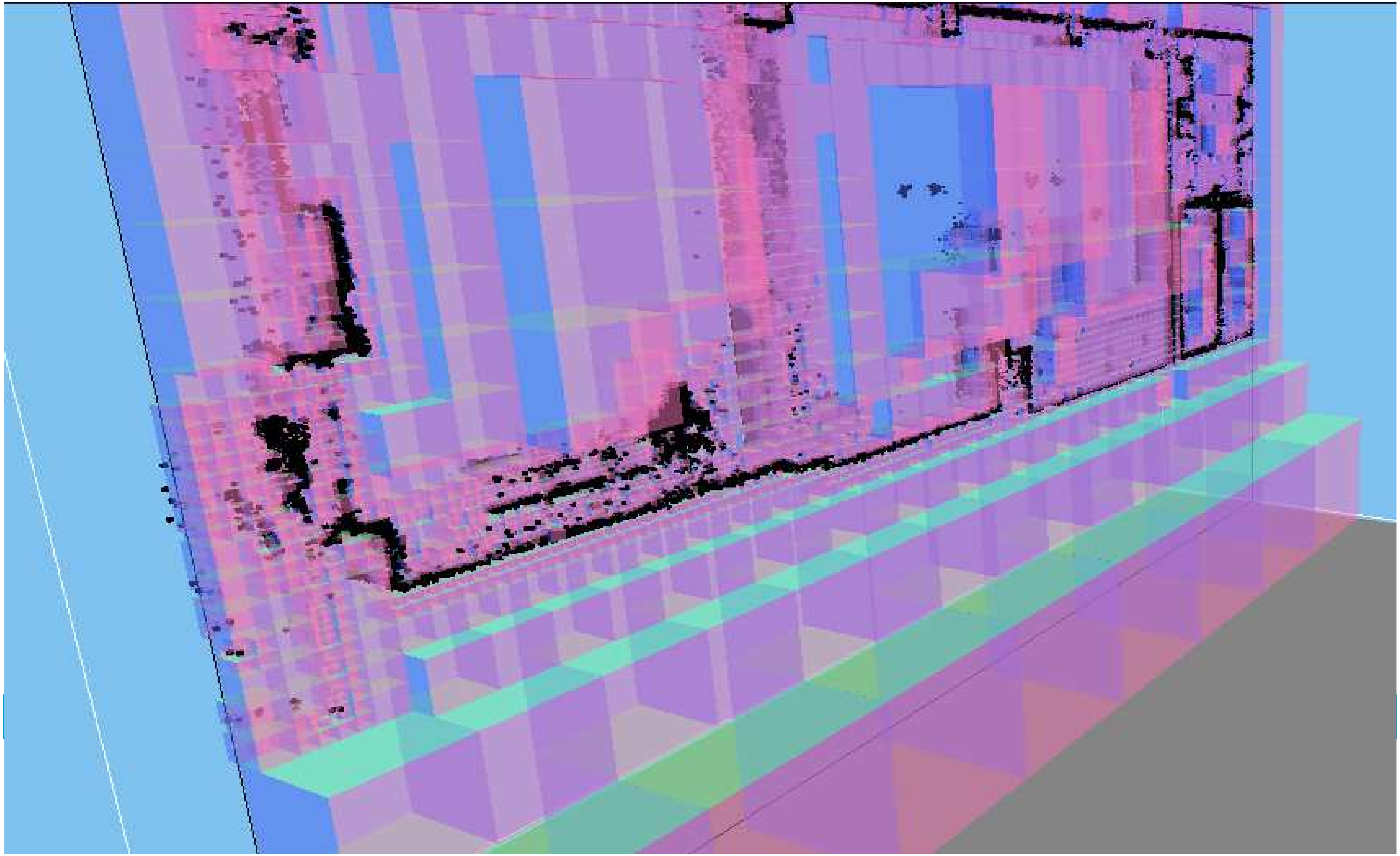
Pointless



Pointless



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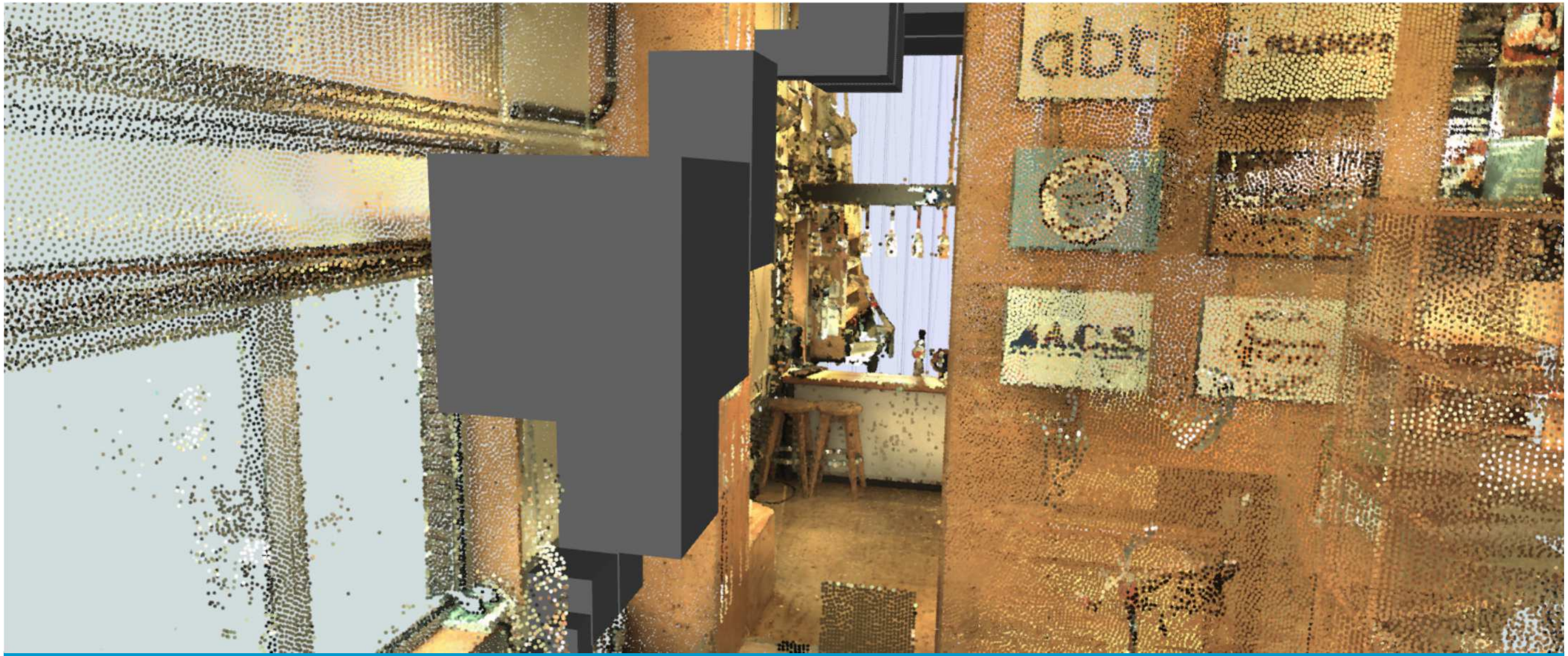
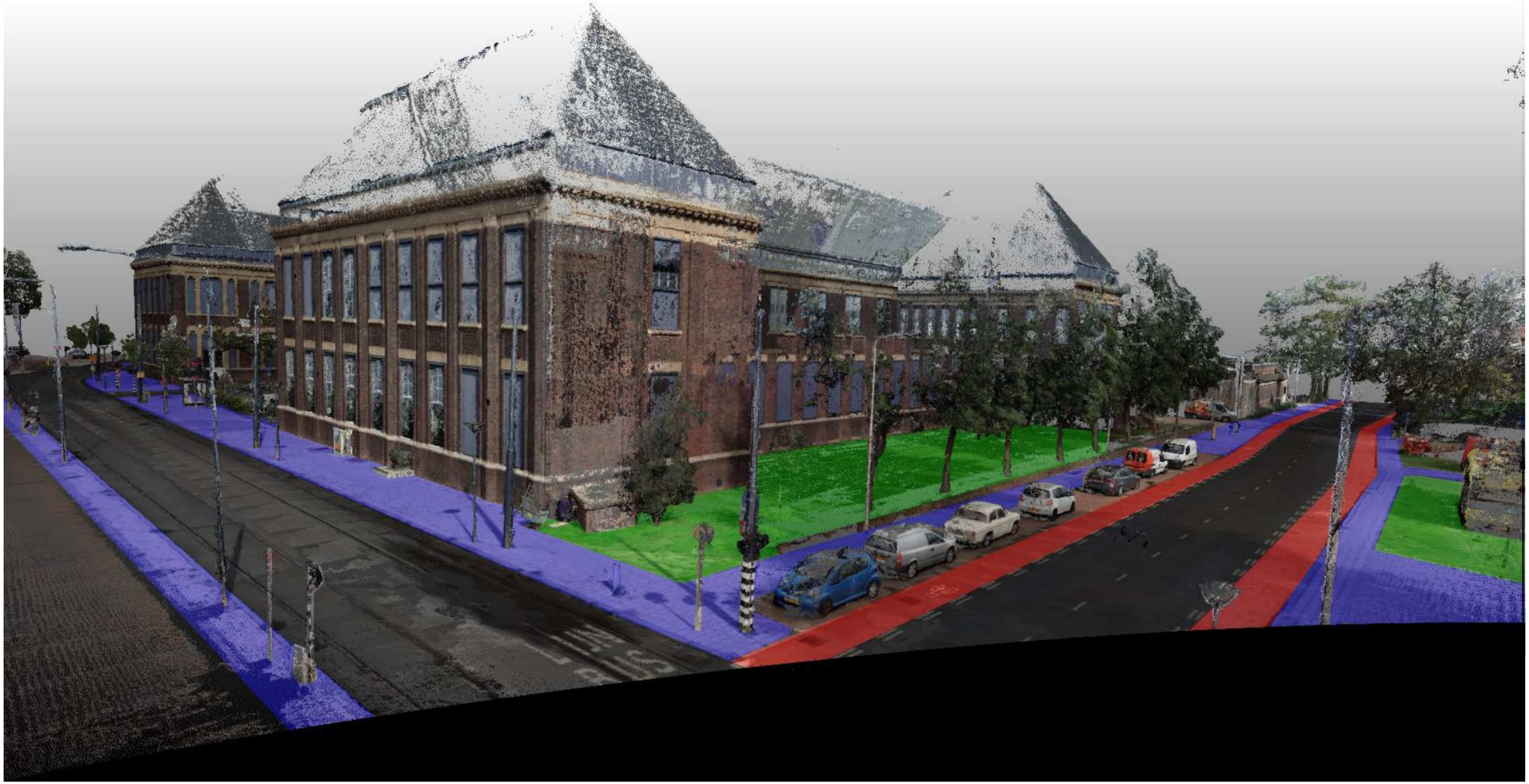
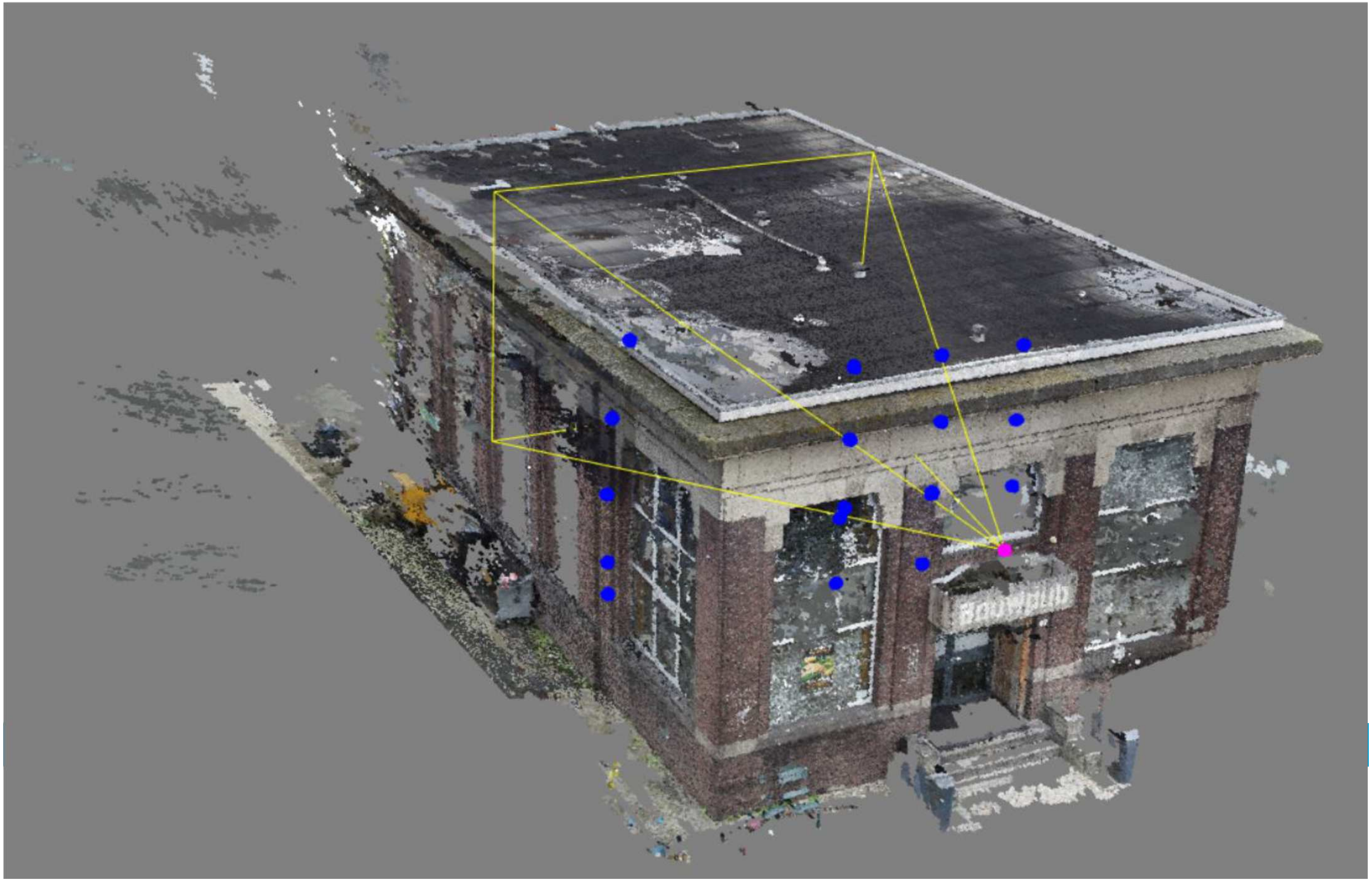


XYZ

XYZ



OWL



Conclusions
Modelling the World

- Point Clouds have more value than the (derived) models
  1. Point Clouds keeps the details
  2. Added value to be revealed by user
- Connecting data acquisition and information retrieval:
  - The world (read: Point Cloud) is its own best model.
  - It is always exactly up to date.
  - It always has every detail there is to be known.
  - The trick is to sense it appropriately and often enough.