

Potree Viewer

File Edit View Window Help

potree.org - github - twitter 1.7

EN - FR - DE - JP - ES - SE

Appearance

Point budget: 3,523,000

Field of view: 60

Eye-Dome-Lighting

Enable

Radius: 1.6

Strength: 0.7

Opacity:

Background

Skybox Gradient Black White None

Other

Splat Quality

Standard High Quality

Min node size: 0

Box

Lock view

Tools

Measurement

Show/Hide labels

Show Hide

Clipping

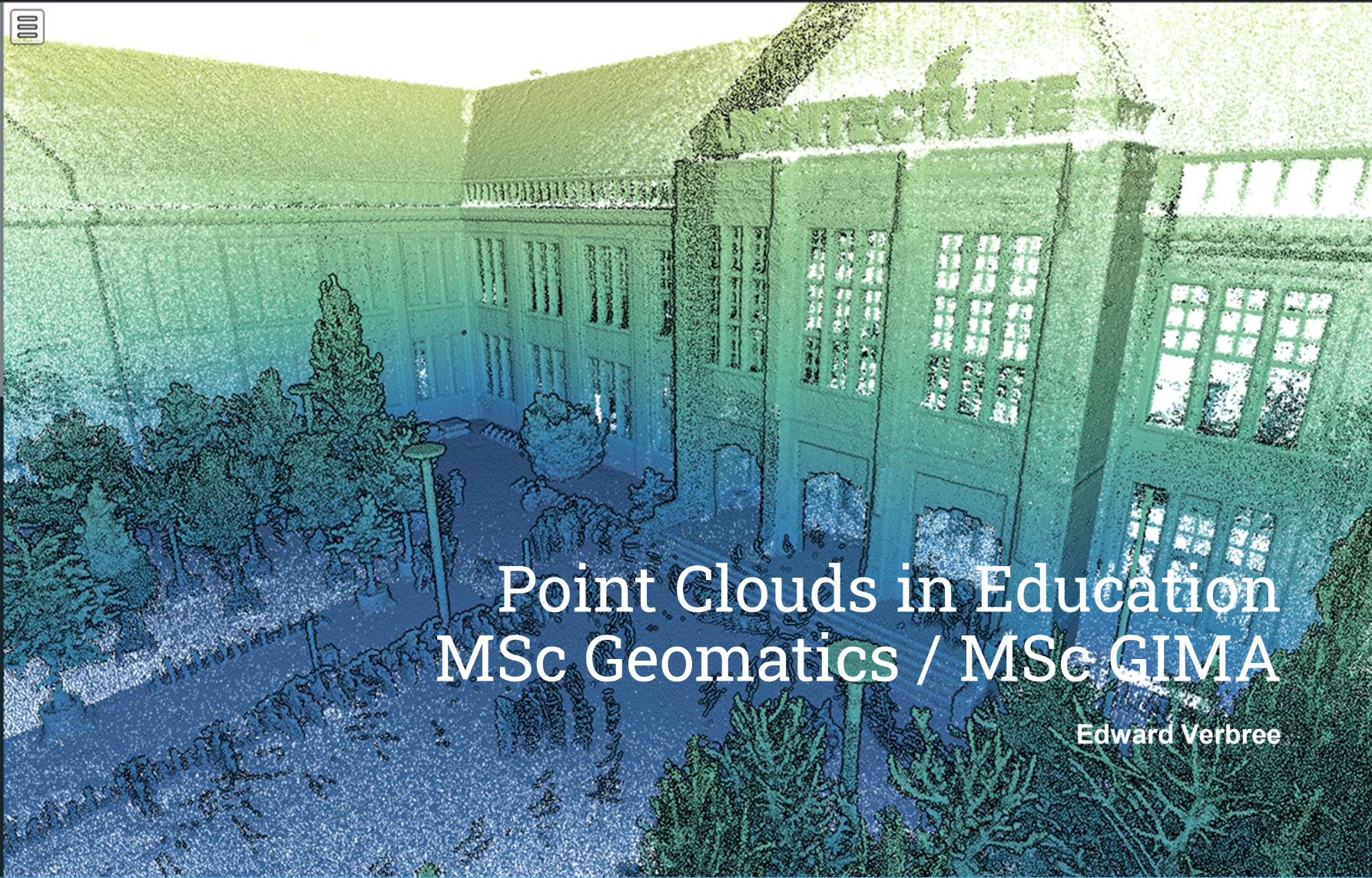
Clip Task

None Highlight Inside Outside

Clip Method

Inside Any Inside All

Navigation



Point Clouds in Education

MSc Geomatics / MSc GIMA

Edward Verbree

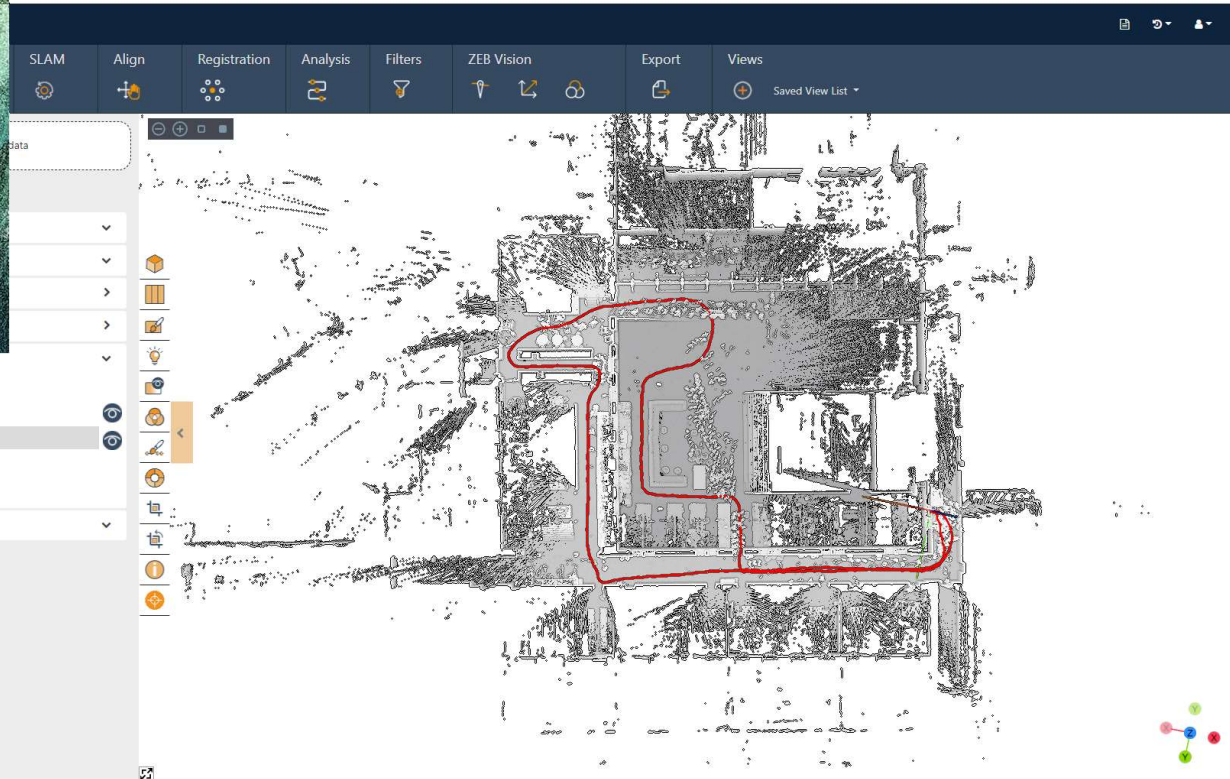
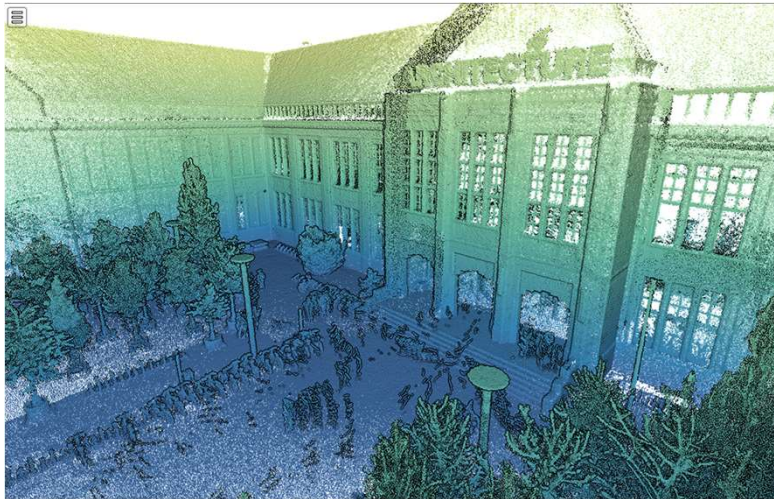
Point Clouds in Education

Content

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 - iPad 12 Pro
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 - MSc Geomatics: Synthesis Project & Thesis Project

Point Cloud Hardware in Education GeoSLAM Zeb Horizon



Point Cloud Hardware in Education iPad 12 Pro

- GIMA Module 6 “Event-based Change Detection”

- Data-acquisition iPad 12 Pro

Above: AHN3 - old building

Centre: AHN4 - demolished

Below: iPad 12 Pro - New building

Apps: EveryPoint, PointCloudScan, Polycam, Scaniverse, etc.

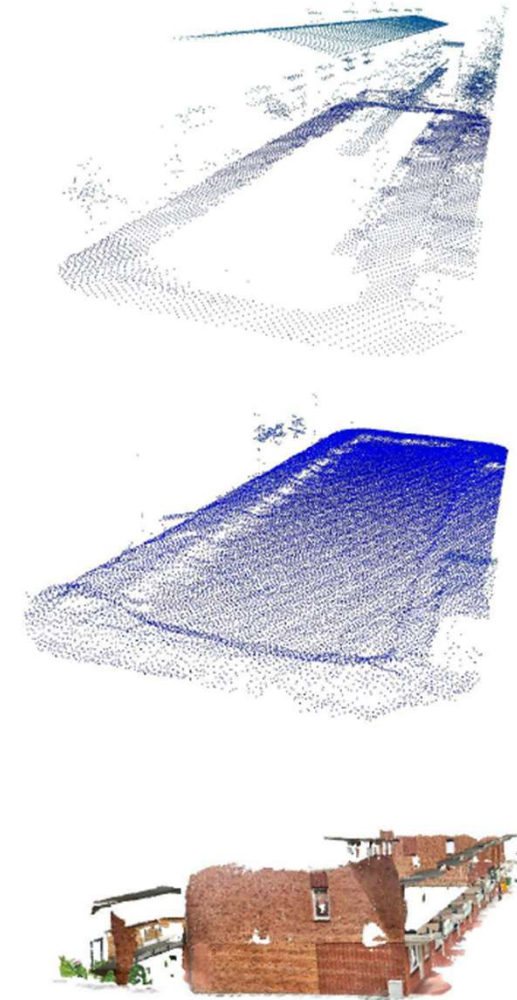


Figure 17: The AHN3 point cloud for Van Schuilenburchstraat 2 is shown above, the AHN4 point cloud in the centre, and the iPad 12 Pro point cloud below.]

ChatGPT in Point Cloud Education:

Why are point clouds important in geomatics education?

- Point clouds are important in geomatics education because they provide a way to represent and analyse the **3D spatial characteristics of real-world environments**.
- They are often used in applications such as surveying, mapping, and GIS, and can be used to create detailed digital models of the earth's surface, **buildings, and other structures**.
- Additionally, point clouds can be used to extract information such as elevation, contours, and feature data, which can be used to support a wide range of **decision-making processes**.
- They also allow for visualization and analysis of large datasets, which can be **useful in education and training for geomatics-related fields**.

ChatGPT in Point Cloud Education:

Why are point clouds a better representation than DTMs?

- Point clouds are considered a better representation than Digital Terrain Models (DTMs) in certain scenarios because **they offer a higher level of detail and accuracy.**
- Point clouds are created by capturing the 3D coordinates of millions of individual points in a real-world environment, whereas DTMs are typically generated by interpolating elevation values from a sparse set of sample points. **This means that point clouds contain more detailed and accurate information about the shape and surface of the terrain.**
- Additionally, **point clouds are able to capture a wider range of features such as buildings, bridges and vegetation,** which are not represented in a DTM.

ChatGPT in Point Cloud Education:

What are 4D Point Clouds?

- 4D point clouds refer to point clouds that include not only the 3D coordinates of individual points, but also **a fourth dimension of information, typically time**. These point clouds are created by capturing multiple 3D scans of a real-world environment at different points in time, and then combining them into a single point cloud dataset.
- 4D point clouds have a wide range of applications in fields such as construction, infrastructure monitoring, and city planning. They can be **used to track changes** in the environment over time, such as the construction of a building or the growth of a city. They can also be used to monitor the condition of infrastructure, such as bridges or roads, over time, which can help identify potential issues before they become critical.
- 4D point clouds can be **visualized as time-series animations**, which can make it easy to see changes in the environment over time. They can also be used to **perform time-series analysis**, which can help identify patterns and trends in the data

ChatGPT in Point Cloud Education: What are nD Point Clouds?

- In summary, nD point clouds refer to point clouds that include more than 4 dimensions of information.
- These point clouds can include additional information such as colour, reflectivity, temperature, and many others, depending on the specific application and the sensors used to capture the data, and they can be used in a wide range of fields such as remote sensing, robotics, and computer vision, where additional information is necessary to understand the environment or make decisions.

ChatGPT in Point Cloud Education:

What are the main research questions in nD Point Cloud research?

- Research on nD point clouds focuses on developing new methods and techniques for capturing, processing, analyzing, and visualizing point cloud data with additional dimensions of information. Some main research questions in this field include:
 - Data Capture: How can we effectively capture nD point cloud data using different sensors and platforms?
 - Data Processing: How can we process and analyze nD point cloud data to extract useful information and features?
 - Data Fusion: How can we combine different types of nD point cloud data to create more comprehensive and accurate models of the environment?
 - Data Visualization: How can we effectively visualize and interact with large, complex nD point cloud datasets?
 - Applications: How can nD point clouds be used to support decision-making and solve real-world problems in fields such as remote sensing, robotics, and computer vision?
 - Scalability: How can we scale up the methods and techniques developed for nD point clouds to handle large datasets and real-time processing.
 - Quality assessment: How can we evaluate the quality of nD point clouds in terms of accuracy, completeness and other criteria, and how can we improve the quality of the data.
 - Machine Learning and Deep Learning: How can we use machine learning and deep learning techniques to analyze nD point clouds and extract information from it.

MSc GIMA & MSc Geomatics

Research embedded in Education

- Module 0 Intro
- Module 6 Advanced Applications
- Module 7 Thesis
 - <https://studenttheses.uu.nl/browse?type=subject&value=Geographical+Information+Management+and+Applications+%28GIMA%29>
- GEO1002 Sensing Technologies
- GEO1004 3D Modelling of the Built Environment
- GEO1006 Geo Database Management Systems
- GEO1011 Synthesis Project
- GEO2020 Thesis
 - <https://repository.tudelft.nl/islandora/search/point%20cloud?collection=education>

Appendix (for reference)

MSc GIMA: Module 6 & Thesis Project

MSc Geomatics: Synthesis Project & Thesis Project

GIMA M6 Case-Studies 2017-2018



POINT CLOUD VISUALISATION

A RESEARCH CREATING AN ASSESSMENT FRAMEWORK FOR POINT CLOUD VISUALISATION



Authors: Struis, N.
Bochove, D.P. van
Drenth, F. I. C.
Roest, R.A. van der

Supervisor: Verbree, ir. E.

USING POINT CLOUDS IN AN ESDA ENVIRONMENT

Explorative research on the usage of point clouds in
ESDA applications for domain experts

Course: Module 6
Supervisor: Ir. E. Verbree

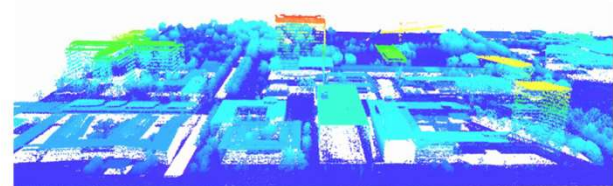
Blue Bakker
6306543
Vloegenkat@gmail.com

Maarten Hogewij
4018745
rlsccscm.maarten@hotmail.com

PointCloudCAT

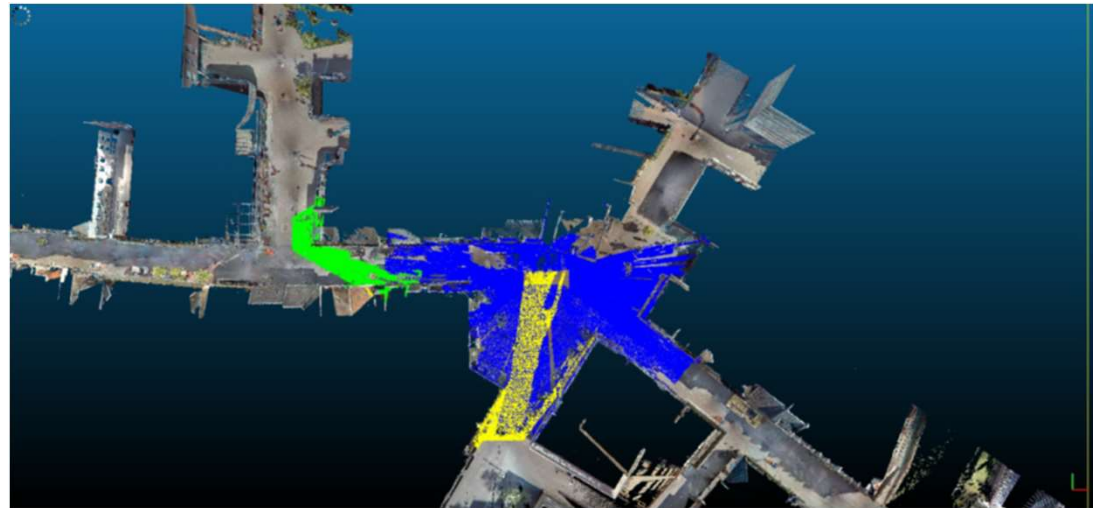
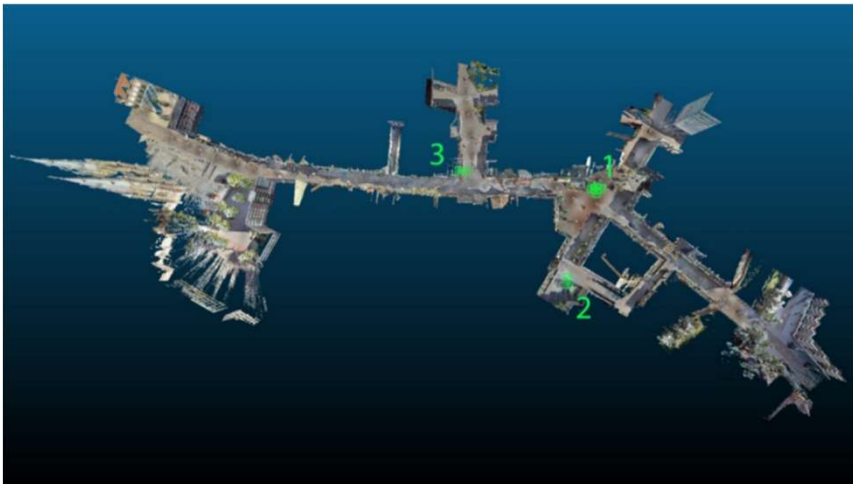
Design Report Towards the development of a point cloud package supporting
point cloud analysis tools as change detection method assessing building
damage

Sara Franken
Jasmijn Kok
Inge van den Meiracker
Lieuwe Visser



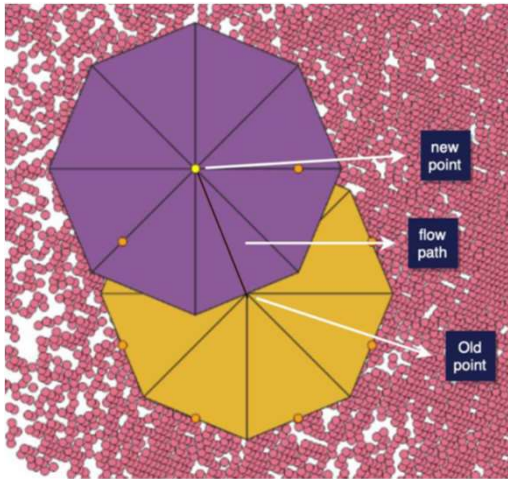
GIMA M6 Case-studies 2018-2019

- Bart-Peter Smit, Marc Baauw, Raoul Steijvers
- Pointing in the right direction
 - CCTV coverage mapping by direct point cloud analysis



GIMA M6 Case-studies 2019-2020

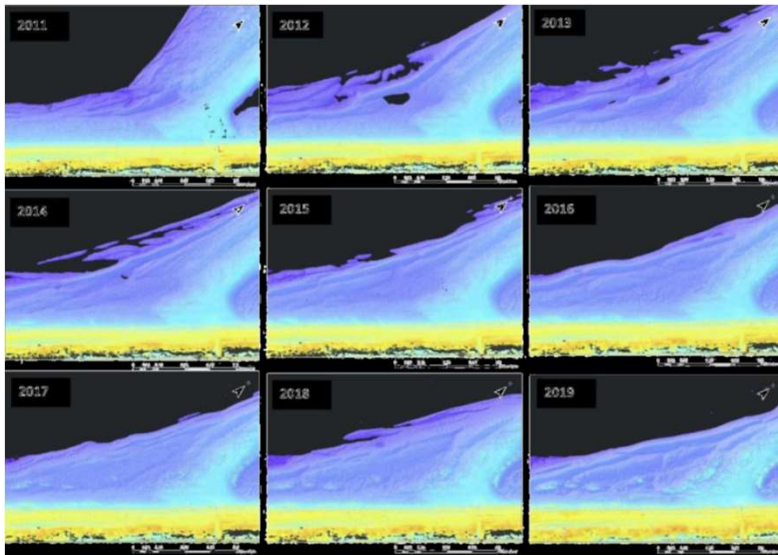
- Group 1: Identifying the added value of point cloud representation in stream delineation modelling in low elevation areas
 - Inez Gortzak, Roos van Rosmalen, Stijn Ticheloven & Jelle Verwer



GIMA M6 Case-studies

2019-2020

- Group 10: Point cloud based coastal change detection and visualisation at the Dutch Zandmotor
 - Foeke Boersma, Luka van der Klaauw, Joost Schuurman & Ynke Schreijer



GIMA M6 Case-studies 2020-2021

- Group: Identifying gentrification with street imagery and point clouds
 - Mandy Bron, Michelle Jansen, Guido Mosch & Daan Visser

Identifying gentrification with street
imagery and point clouds

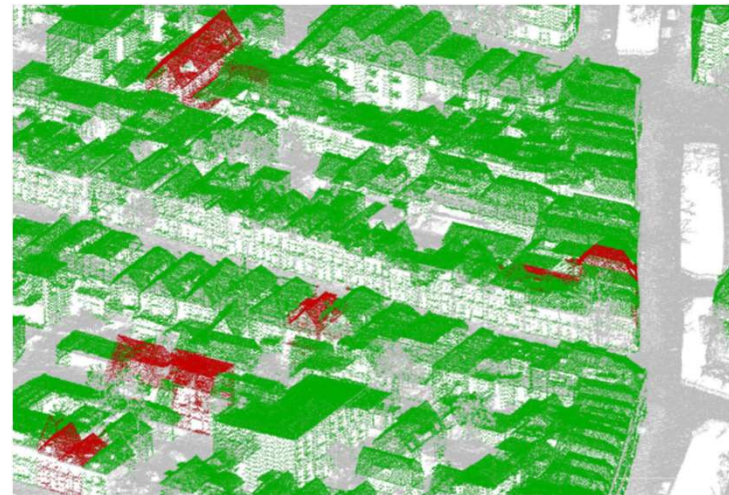
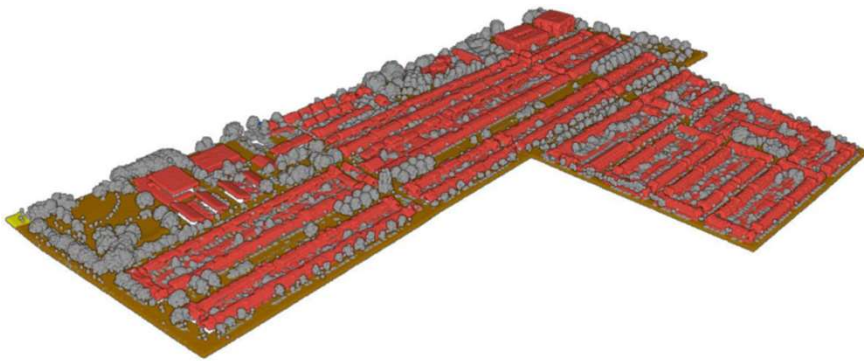


Figure 3.3: The point cloud comparison (left 2008, right 2021)

A CASE STUDY ON IDENTIFYING GENTRIFICATION AT THE
WEST-KRUISKADE, ROTTERDAM

GIMA M6 Case-studies 2021-2022

- Group A: Analyse Energy Efficiency of Buildings
 - Applicability of Point Clouds
- Group B: Event-based change detection
 - Assessing the potential of using BAG change-events as signals for local AHN data acquisition



MSc GIMA

Thesis

- Christian Riesner, 2022
Integrating Ground Penetrating Radar data in a GIS to detect unmarked graves via a Convolutional Neural Network framework for 3D point cloud interpretation
[pdf](#) [bib](#)
- Marc Baauw, 2021
Maintaining an up to date digital twin by direct use of point cloud data
[pdf](#) [bib](#)
- Nienke Vogelzang, 2021
Improvement of Land Subsidence Communication through Point Cloud Visualizations
[pdf](#) [bib](#)

MSc GIMA

Thesis

- Stijn Ticheloven, 2021
The added value of direct point cloud analysis in hydrology: A new method to derive streams from LiDAR data
[pdf](#) [bib](#)
- Ynke Schreijer, 2021
Visual insight into the temporal changes of sand patterns along the Dutch coast
[pdf](#) [bib](#)
- Derek van Bochove, 2019
The combination of Mobile Laser Scanning and Airborne Laser Scanning point cloud data at the municipality of Rotterdam
[pdf](#) [bib](#)

MSc Geomatics Synthesis Project

- “Adsum ergo sum.” I am here, therefore I am: Indoor localisation for blind people with use of LiDAR scanning and ArcGIS Indoors
- Dechamps, Louis (author), van Esch, Marieke (author), Hengelmolen, Maren (author), Kan, Leo (author), YANG, Yue (author)
- Blind and visually impaired people currently have inconveniences locating themselves in the indoor environment. No standardized system exists for them yet. After an inventory of the requirements of blind people, different representations do qualify for providing specific information blind people need. The main research question is: "How can..."
- student report 2022

MSc Geomatics Synthesis Project

- Inferring roof semantics for more accurate solar potential assessment
- Apra, Irène (author), Bachert, Carolin (author), Caceres Tocora, Camilo (author), TUFAN, ÖZGE (author), Veselý, Ondrej (author)
- Led in cooperation with the company Brink, who provides management and consultation services for construction and real estate sectors, this Synthesis Project aims at automatically deriving meaningful information about buildings. More precisely, the focus is to automatically detect roof obstacles - such as dormers, chimneys, and solar panels - to...
- student report 2021

MSc Geomatics Synthesis Project

- 3D Representations for Visual Insight
- FU, RUNNAN (author), JIN, Yuzhen (author), LIU, ZHENYU (author), Mainelli, Xenia Una (author), PAPAKOSTAS, THEODOROS (author), Wang, Linjun (author)
- As a method that can accurately represent 3D spatial information, point cloud visualisation for indoor environments is still a relatively unexplored field of research. Our client for this project, the Dutch National Police, requested a variety of potential solutions for visualising (unfamiliar) indoor environments that can be viewed by both...
- student report 2021

MSc Geomatics Synthesis Project

- Tree Reconstruction from a Point Cloud using an L-system
- Dobson, Daniel (author), Dong, Haoyang (author), van der Horst, Noortje (author), Langhorst, Lars (author), van der Vaart, Jasper (author), Wu, Ziyang (author)
- Storing accurate models of complex geometries in a compact way has become an increasingly challenging issue, especially when dealing with large datasets. One of such datasets is Cobra-Groeninzicht's database of all trees in the Netherlands. In the gaming industry, a new technique is being used to generate tree models: the L-system. An L-system...
- student report 2021

MSc Geomatics Synthesis Project

- SCIPoC: Semantic Classification of Indoor Point Cloud: A study into the possibilities of classifying indoor point cloud using a Deep Learning approach
- Smit, M. (author), Chen, Z. (author), Erbaşu, M.A. (author), Gaol, Y.A.L. (author), Li, X. (author)
- With the constantly evolving range of applications for technology the quality and amount of data constantly increases as well. In this growing data environment, there is a constant search to provide more value to all data that is available for as little effort as possible. Our research tries to add such additional value by diving into the...
- student report 2020

MSc Geomatics Synthesis Project

- Direct Analysis on Point Clouds: Geomatics Syntesis Project 2019
- Kaniouras, Pantelis (author), MOSCHOLAKI, Maria (author), van Liempt, Jordi (author), Jarocki, Konrad (author), Zhang, Liyao (author)
- With the rapid growth in point cloud acquisition technologies the recent years we have the ability to measure large quantities of 3D points of significantly detailed and geometrically composite scenes such as urban environments. This advantage can be exploited and used for direct analysis on point clouds. A direct point cloud analysis has...
- student report 2019

MSc Geomatics Synthesis Project

- Towards point cloud harmonization: Harmonization of point cloud datasets with varying coordinate reference systems
- Sirdeshmukh, Neeraj (author), Kotoula, Lydia (author), Christodoulou, Antria (author), Manolova, Manuela (author), Oostwegel, Laurens (author)
- This paper has its focus on the accessibility, interoperability and quality of different point cloud datasets. The main objective of the project is to research the process of harmonizing point cloud datasets of different origins and to incorporate the integrated datasets in a web viewer that allows for visualization and analysis. As a case study...
- student report 2017

MSc Geomatics Synthesis Project

- Chronocity: Technical Report Towards an Open Point Cloud Map supporting on-the-fly change detection
- Cemellini, Barbara (author), van Opstal, Willem (author), Wang, Cheng-Kai (author), Xenakis, Dimitris (author)
- We are now gradually entering the era of big data - maybe a bit too much of a buzzword, but it is not lied. Technology is evolving fast, enabling faster and more efficient data acquisition, storage, retrieval and processing. Point cloud datasets are such a type which relies on large files and lots of processing power. The rather fast evolutions...
- student report 2017

MSc Geomatics Synthesis Project

- A vario-scale approach that improves integration of point clouds with different point densities
- Hemmes, Tom (author), Li, Weiran (author), van der Maaden, Jippe (author), Olsen, Brenda (author), Veenendaal, Marc-Julien (author)
- Point clouds are becoming one of the most common ways to represent geographical data. The scale of acquisition of point clouds is growing steadily. However, point clouds are often very large in storage size and require computationally intensive operations. The integration of point clouds nowadays still face a lot of challenges. This project...
- student report 2017

MSc Geomatics Synthesis Project

- Project Pointless: Identifying, visualising and pathfinding through empty space in interior point clouds using an octree approach
- Broersen, T. (author), Fichtner, F. (author), Heeres, E.J. (author), De Liefde, I. (author), Rodenberg, O.B.P.M. (author)
- The direct use of explorative point cloud data for calculations, observations and classifications.
- student report 2015

MSc Geomatics Thesis

- Ioannis Dardavesis, 2022
Indoor localisation and location tracking in semi-public buildings based on LiDAR point clouds and images of the ceilings
[pdf](#) [link](#) [bib](#)
- Zhenyu Liu, 2022
Dynamic Objects Detection and Removal in Mobile Laser Scanning Data,
[pdf](#) [link](#) [bib](#)
- Xenia Una Mainelli, 2022
Exploring Isovist Applications in Third-Person View Visualisations of Outdoor Space Boundaries Using Point Clouds,
[pdf](#) [link](#) [bib](#)
- Mels Smit, 2022
Deducing the Location of Glass Windows in 3D Indoor Environments
[pdf](#) [link](#) [bib](#)

MSc Geomatics Thesis

- Liyao Zhang, 2020
Visualization of Point Cloud Models in Mobile Augmented Reality Using Continuous Level of Detail Method
[pdf](#) [bib](#)
- Mutian Deng, 2020
Using Foreign Data Wrapper in PostgreSQL to Expose Point Clouds on File System
[pdf](#) [bib](#)
- Anastasia Anastasiadou, 2019
A probabilistic analysis of results of co-registration of aerial and mobile laser-scanned point clouds
[pdf](#) [link](#) [bib](#)
- Jippe van der Maaden, 2019
Vario-scale visualization of the AHN2 point cloud
[pdf](#) [link](#) [bib](#)
- Antria Christodoulou, 2018
An image-based method for the pairwise registration of mobile laser scanning point clouds
[pdf](#) [link](#) [bib](#)