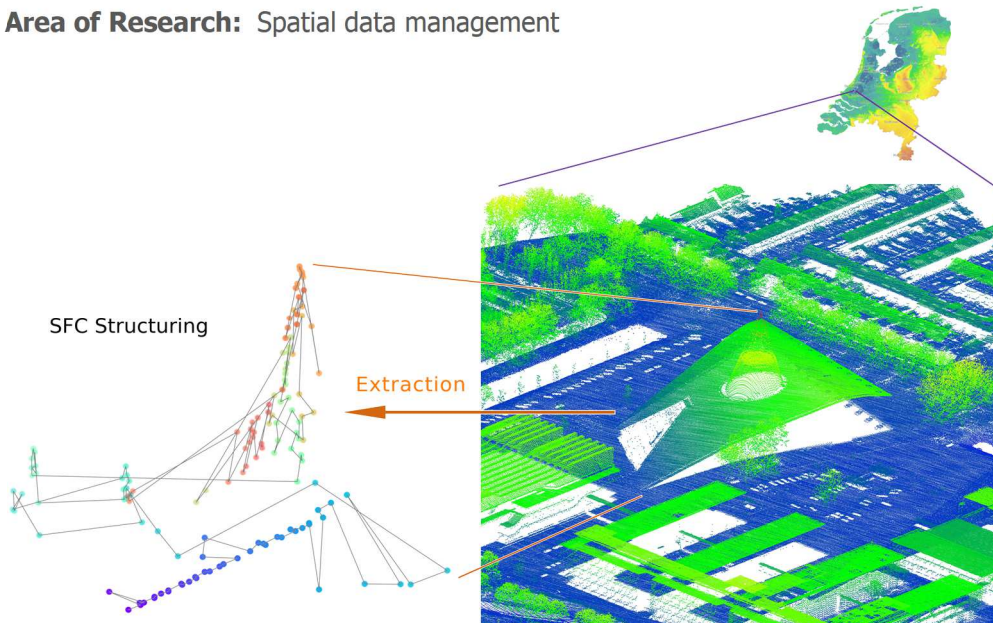


Towards 10^{15} points management – an nD PointCloud approach

Keywords: Point clouds, Data management, Dimension, Level of detail, Space filling curve

OTB Department / GIS Technology

Area of Research: Spatial data management

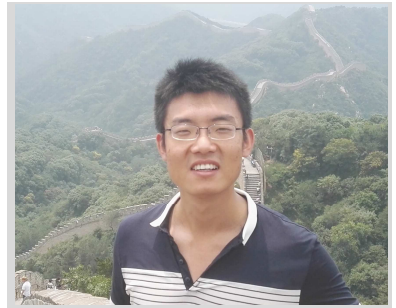


Research Summary: Drastically increasing production of point clouds as well as modern application fields like robotics and virtual reality raise essential demand for smart and highly efficient data management. However, effective tools for the management and direct use of large point clouds are missing. Current state-of-the-art database management systems present critical problems, such as inefficient loading and indexing, lack of support for continuous Level of Detail (LoD) and limited functionalities. Previous research has suggested and demonstrated the importance of converting property dimensions, such as time and classification to organizing dimensions for efficient data storage and retrieval. However, a thorough theory and validation are still needed. Besides, how new computational platforms, such as cloud computing systems could facilitate massive point clouds management also needs further exploration.

Research Methodology: I will first devise an adapted smartPointCloud model which guides the implementation of the data management considering new contextual environment. Then, I will implement an nD PointCloud structure which integrates similar dimensions into a Space Filling Curve (SFC) key together with the development of related tools for interaction. Different data, such as airborne/mobile laser scanning data and GPS points will be utilized. Meanwhile, applications including visualization, change detection, trajectory extraction and indoor navigation will be implemented. Moreover, I will deploy the nD PointCloud structure on a cloud computing system with specified streaming, transmission and caching strategies. The overall performance will be assessed by performing a comprehensive benchmark test.

Key Publications:

- Liu, H., Van Oosterom, P., Meijers, M. and Verbree, E., 2018. Management of large indoor point clouds: an initial exploration. *International Archives of the Photogrammetry, Remote Sensing & Spatial Information Sciences*, 42(4), pp. 365-372.
- Liu, H., Van Oosterom, P., Meijers, M. and Verbree, E., 2018. Towards 10^{15} -level point clouds management - a nD PointCloud structure, In: *Geospatial Technologies for All: Short papers, posters and poster abstracts of the 21th AGILE Conference on Geographic Information Science*, Lund University, pp. 7.



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Main Question:
What is an optimal point cloud data structure supporting different types of applications processing 10^{15} points from the perspective of efficiency and functionality?

Deliverables:
Theory and implementation of novel data structures

Link(s):
www.gdmc.nl

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