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Short code (preferred abbreviation/code)

[TA14-2-1-1]

Concept title

Point clouds

Contributors (all experts so far involved in the discussion of the concept)

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Description

Point clouds represent a set of points with X, Y, Z coordinates and associated attributes. A source of acquisition is Light Detection and Ranging (LIDAR) sensor.

Depending on the location of the recording device, i.e. where and on which the LIDAR systems are mounted, it can be divided into: Terrestrial Laser Scanning (TLS), Airborne Laser Scanning -ALS) and Spaceborne Laser Scanning (SLS).

The LIDAR system uses the near-infrared part of the electromagnetic spectrum (1064 nm) for active data collection, day or night, in the shade, but also in low visibility conditions (e.g. under clouds). Due to the footprint of the beam itself, when interacting with vegetation, one part will be reflected back, registering the height of the vegetation, and part of the beam will pass to another surface from which the other part of the beam will be reflected. Depending on the beam intensity and vegetation density this can happen a few times until it hits a hard surface and the rest of the beam is reflected.

In this way, precise information on the height and density of vegetation can be obtained, but also using automatic and semi-automatic data filtering techniques, it is possible to create several very high resolution products from source data: digital elevation model (DEM), digital relief model (DMR) digital canopy model (DCM) , digital surface model (DSM).

Depending where the sensor is mounted, the density of collected point clouds can be from 15 points per m2 to as many as 250 points per m2 (in the case of UAV data collection). This is also depending on the speed and altitude of the flight and the speed and power of the emitted pulse or beam. The biggest advantage of LIDAR scanning is that in most cases, a sufficient number of beams will always penetrate to the ground, allowing the creation of a very precise digital relief model which is the basis for further analysis. This is not always possible in very dense vegetation areas (rainforests).

The advantage of LIDAR point clouds lies in the fact that it truly provides a huge amount of information gathered in a short period of time, that are of exceptional precision. These point clouds have very wide application from forestry, surveying, architecture to archeology.

Given the development of technology, it is possible to obtain a similar point cloud by photogrammetry methods. However, photogrammetric cameras (eg orthophotos and infrared cameras) have one significant drawback, they cannot penetrate clouds, vegetation and water, and only DSM product can be extracted from them.

Super-concept

- [\[TA14-2\] Descriptive analytics products](#)
- [\[TA14-2-1\] Descriptive analytics products](#)

Skills

- Interpret the output of a point cloud measurement
- Understand what products can be extracted from point clouds
- Understand the technology behind LiDAR as an active sensor and what makes it different from the other existing Remote Sensing approaches
- Develop thorough understanding of the complex process from collecting the LiDAR data to generation of the final modeled outputs

References

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- Balenović, I., Alberti, G., i Marjanović, H. (2013): Airborne Laser Scanning - the Status and Perspectives for the Application in the South-East European Forestry. SEEFOR 4(2), 59-79. <https://www.seefor.eu/vol-4-no-2-balenovic-et-al-airborne-laser-scanning-the-status-and-perspectives-for-the-application-in-the-south-east-european-forestry.html>
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