Voxel-based individual tree detection from airborne laser scanning point cloud data

Aino Weckman
30.6.2021

Advisor: *Juha Hyyppä*
Supervisor: *Pauliina Ilmonen*

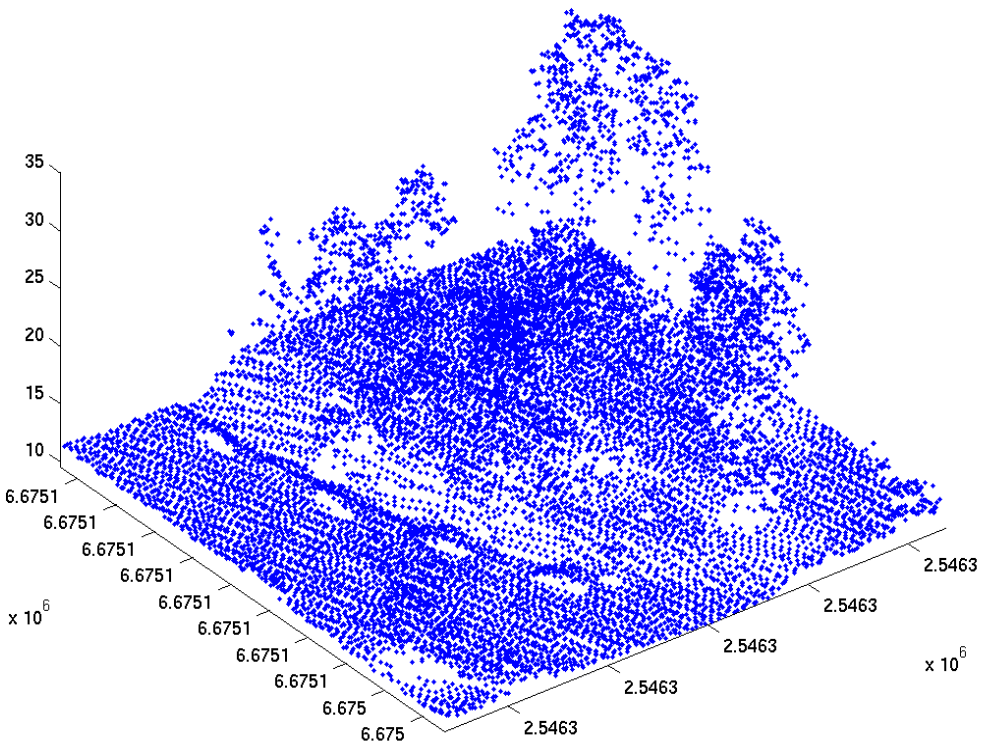
NLS
FINNISH GEOSPATIAL RESEARCH INSTITUTE
FGI

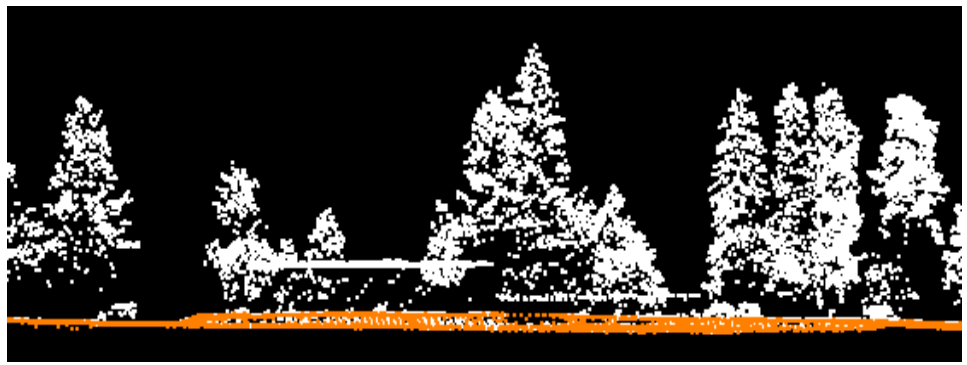
Background

- Traditionally the individual tree detection is done with a rasterised data:

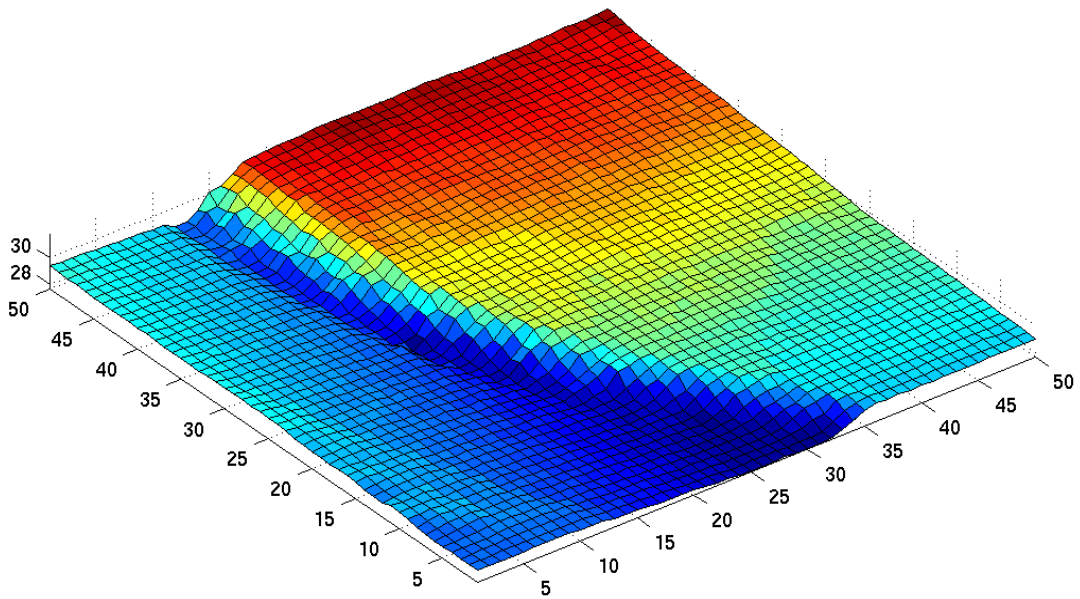
1. Calculation of canopy height model
2. Use of segmentation or clustering to detect individual trees or tree groups
3. Calculation of stand characteristics, e.g. crown area, species and volume

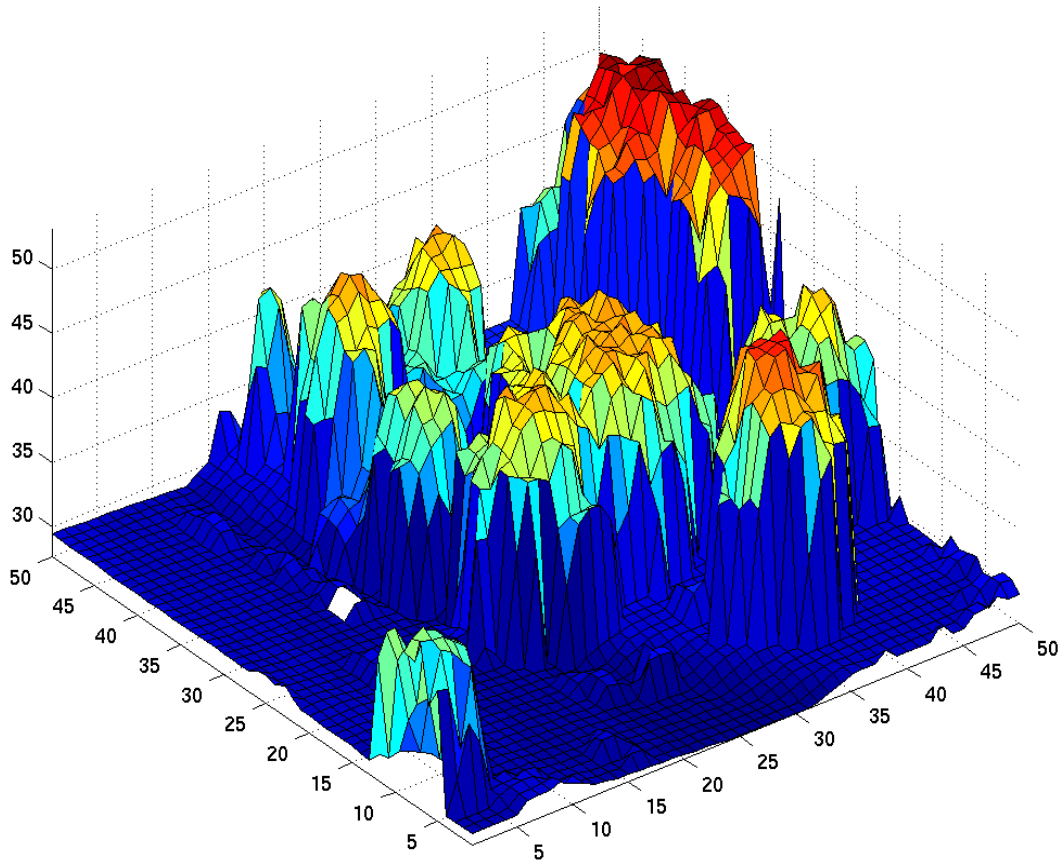
Example with 2D: Original points



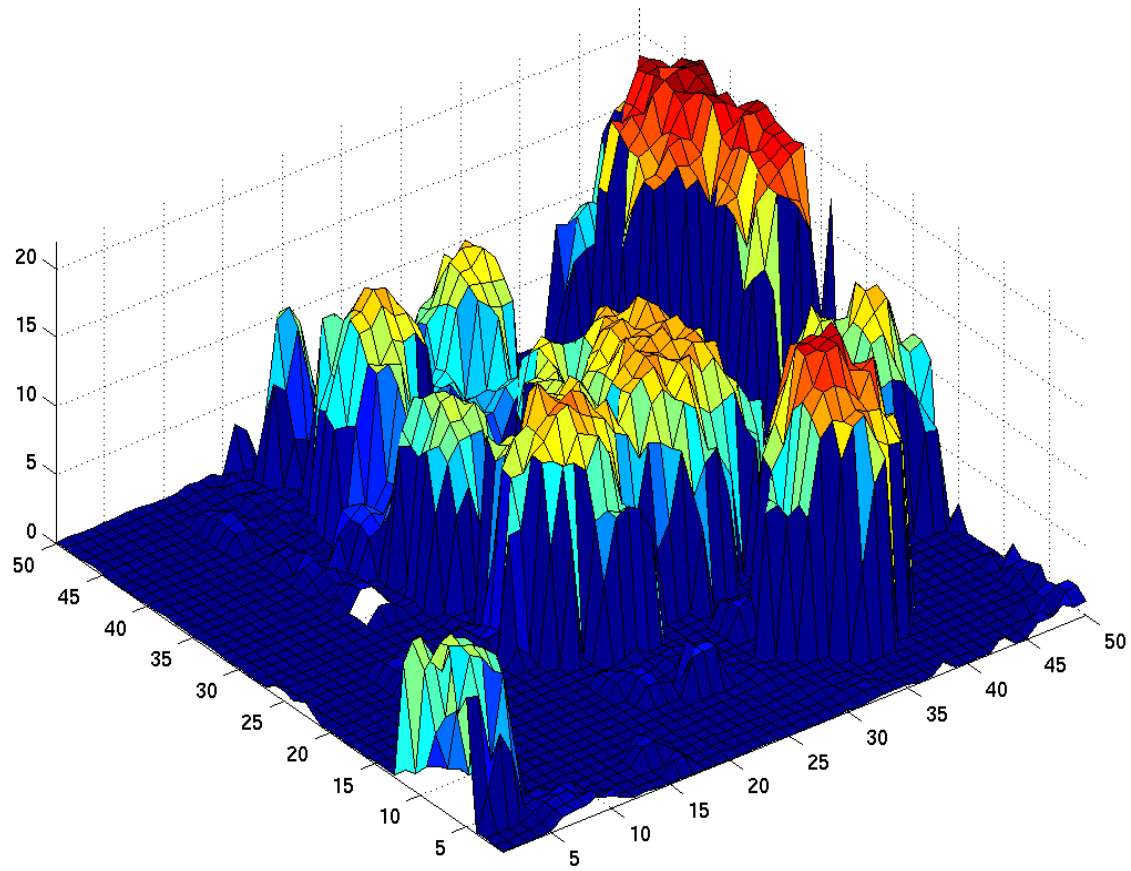


Digital Terrain Model and Digital Surface Model



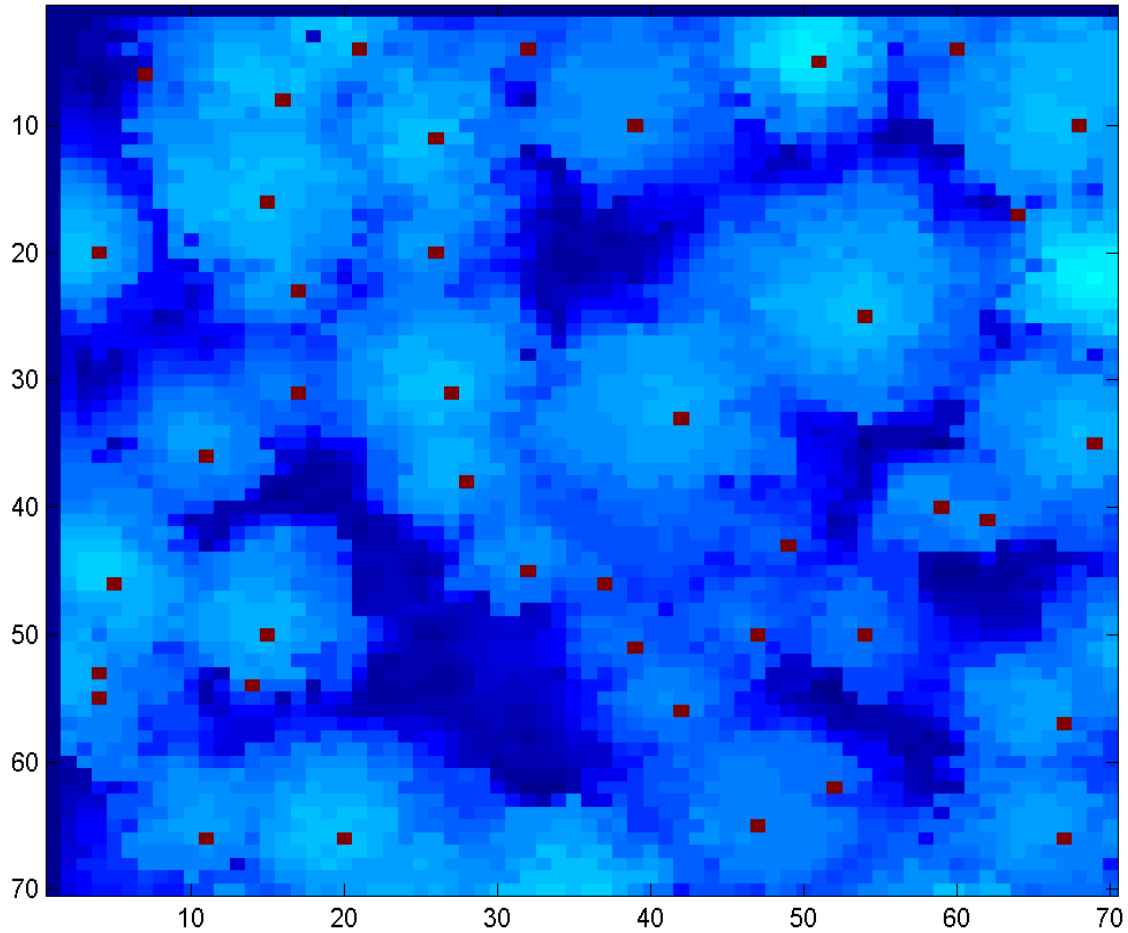


Canopy Height Model



The CHM was obtained by subtracting DTM from DSM

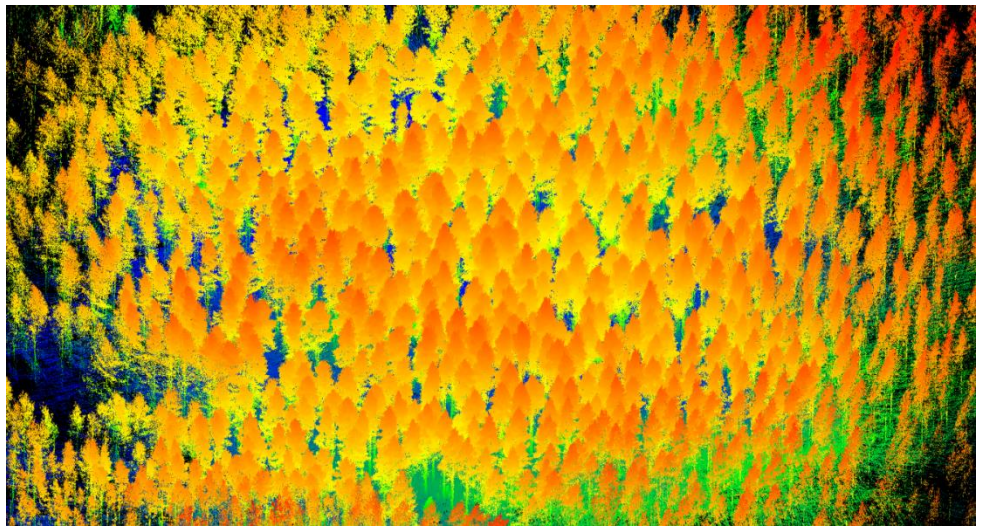
Finding Tree Locations

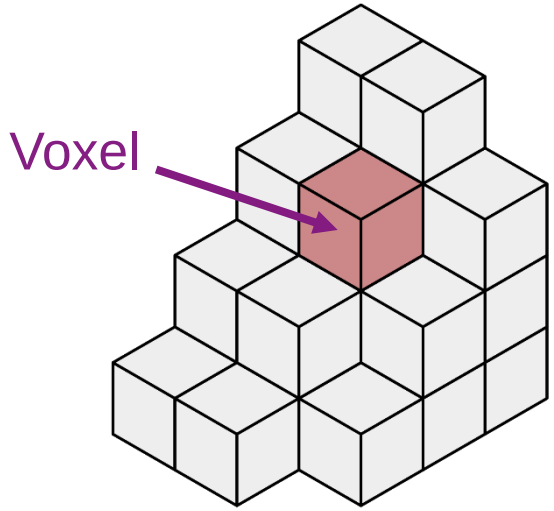


NLS
FINNISH GEOSPATIAL
RESEARCH INSTITUTE
FGI

Objective

- The objective is to develop a voxel-based algorithm to detect individual trees as accurately as possible from dense airborne laser scanning point clouds





https://en.wikipedia.org/wiki/Voxel, 18.6.2021

Tools

- MATLAB

Schedule

- 30.06.2021 Seminar (today)
- 06/21 Reading materials and playing with different ideas
- 07-08/21 Implementing the algorithm
- 06-09/21 Writing my thesis
- 09/21 My thesis will be ready

Literature and references

- Juha Hyyppä, Xiaowei Yu, Hannu Hyyppä, Mikko Vastaranta, Markus Holopainen,Antero Kukko, Harri Kaartinen, Anttoni Jaakkola, Matti Vaaja, Jarkko Koskinen,et al. Advances in forest inventory using airborne laser scanning.Remote sensing,4(5):1190–1207, 2012
- Juha Hyyppä and Mikko Inkinen. Detecting and estimating attributes for singletrees using laser scanner.Photogramm J Finland, 16:27–42, 1999. URL https://ci.nii.ac.jp/naid/10015710972/en/.
- Barbara Koch, Ursula Heyder, and Holger Weinacker. Detection of individual tree crowns in airborne lidar data.Photogrammetric Engineering RemoteSensing, 72(4):357–363, 2006. ISSN 0099-1112. doi: doi:10.14358/PERS.72.4.357. URL https://www.ingentaconnect.com/content/asprs/pers/2006/00000072/00000004/art00001.
- Lothar Eysn, Markus Hollaus, Eva Lindberg, Frédéric Berger, Jean-Matthieu Monnet,Michele Dalponte, Milan Kobal, Marco Pellegrini, Emanuele Lingua, DomenMongus, et al. A benchmark of lidar-based single tree detection methods usingheterogeneous forest data from the alpine space.Forests, 6(5):1721–1747, 2015.