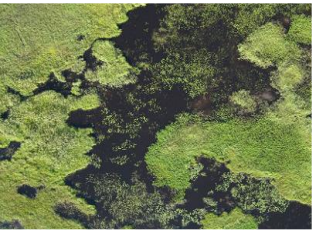
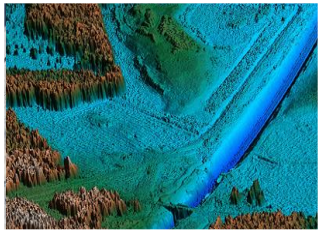
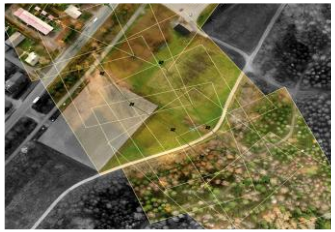
Paikkatiedon hankinta lennokilla

PIEneering
Parallel Image Engineering



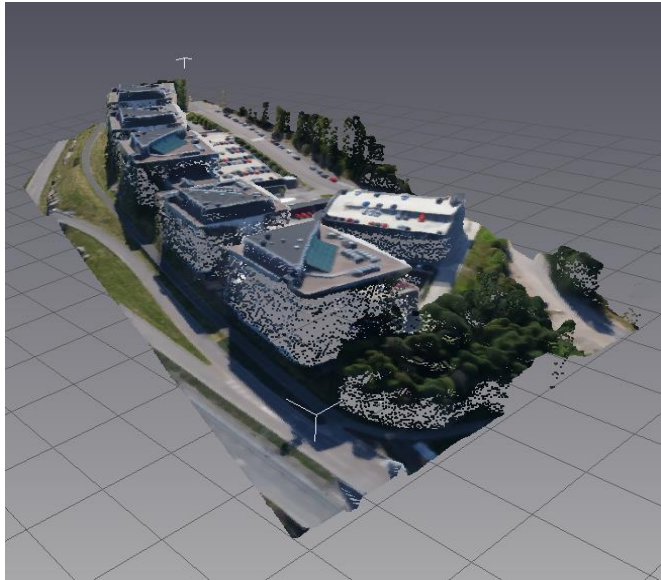



Geodesian teemapäivä 10.9.2014

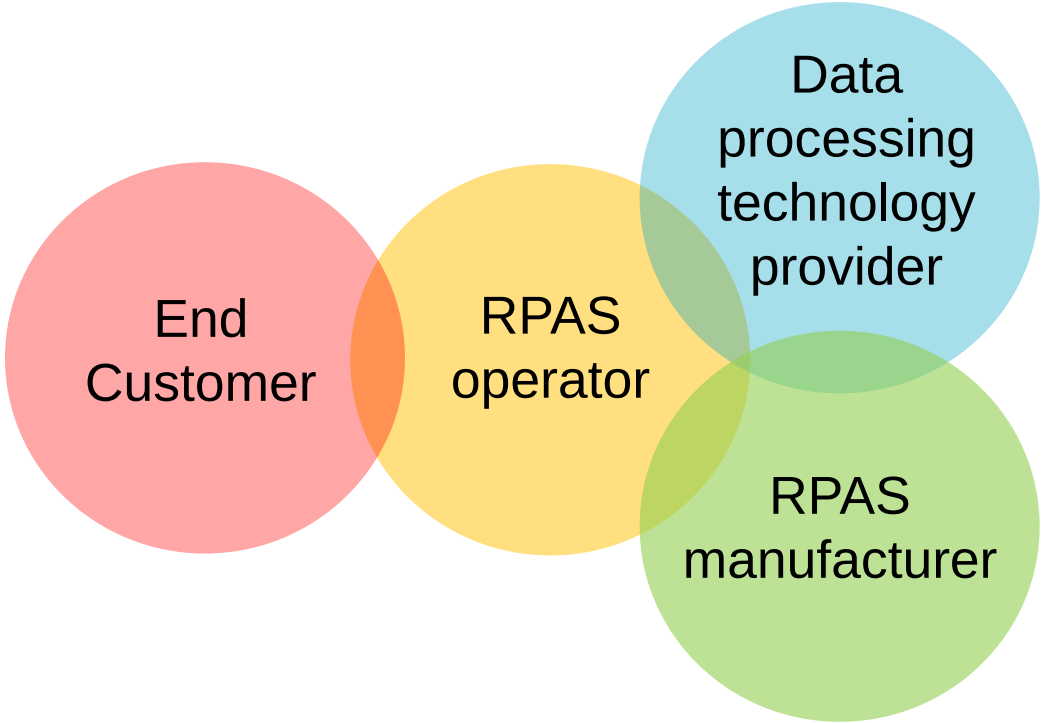
The Ground Truth.

PIEneering

- Perustettu 2003
- Fotogrammetrian ohjelmistot ja palvelut

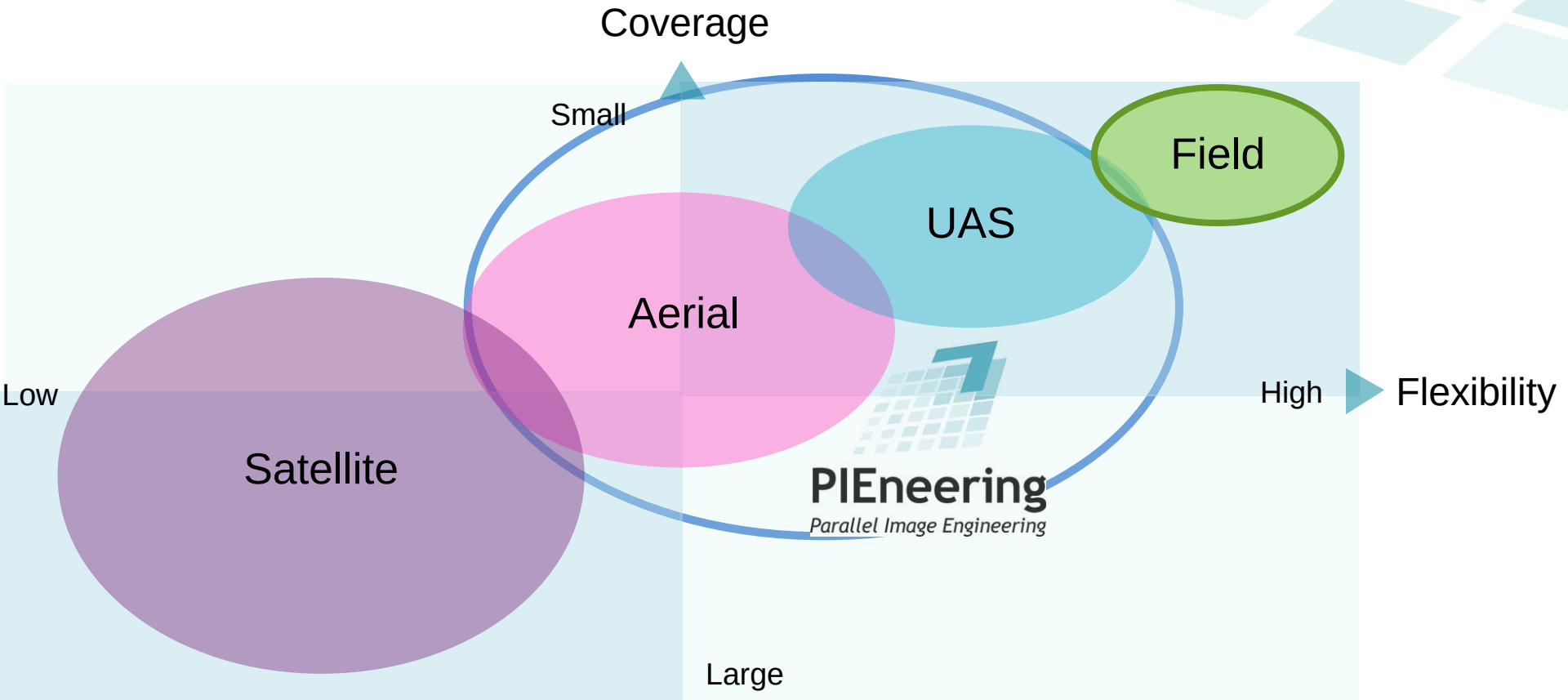


Arvoketju



PIEneering
Parallel Image Engineering

Lennokkikartoitusmenetelmä



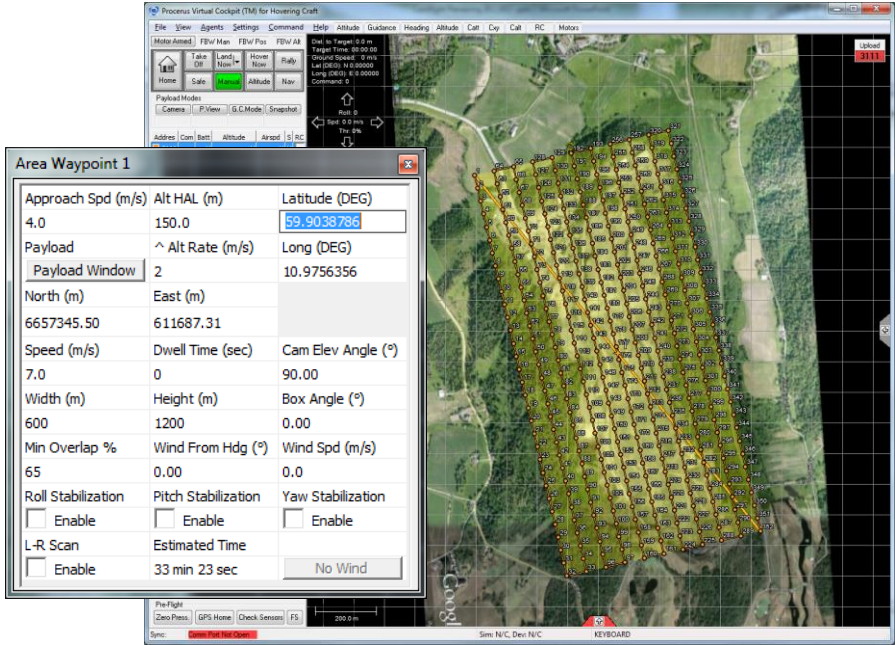
Lennokkijärjestelmä

- Siipi / runko
- Autopilotti
- Sensori
- Virtalähde
- Ohjaustietokone
- Radiolinkki
- Lähdön ja laskeutumisen hallintajärjestelmä

PIEneering
Parallel Image Engineering

Tehtävänvalmistelu

- Kohdealueen kattaminen / lentojen lkm (vs. akut)
- Lentokorkeus, peitot (%)
- Lähtö / laskeutumispaikat
- Sää
- Kameran asetukset
- Lennonjohto / säännökset
- GPS-pisteet



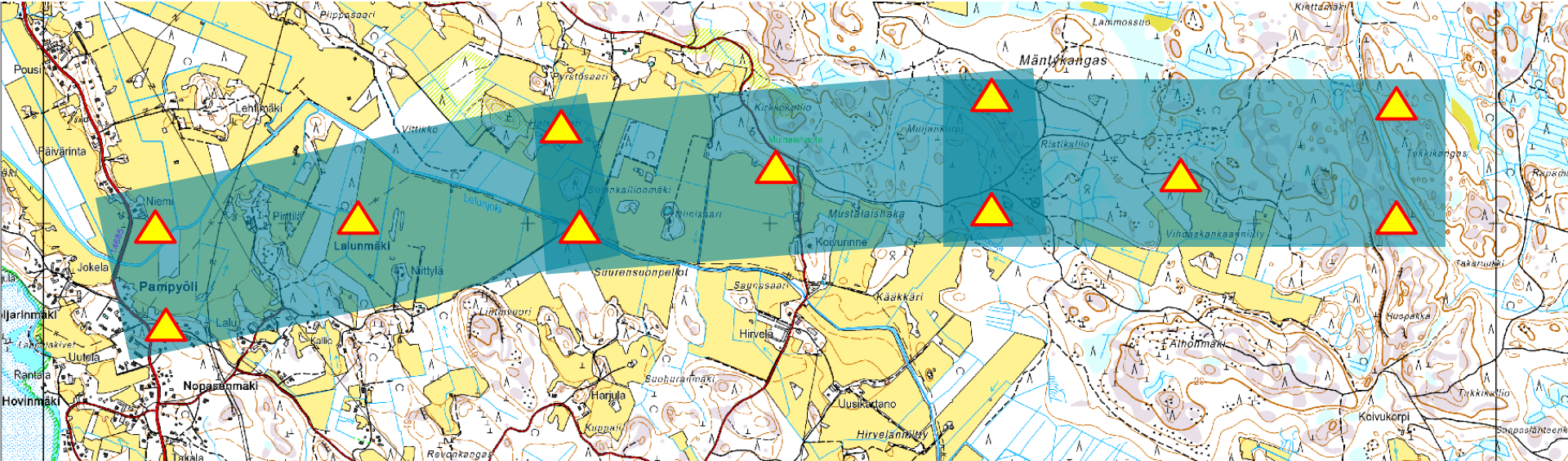
Säännöksistä

- Lentokorkeus enintään : 500 feet / 150m
- Visual Line of sight
- Seuranta / tehtävän keskeyttämisvalmius
- Lentopaikan lähestymisalueella luvanvaraista (TMA / TMC
- Trafin UAS/RPAS strategiatyö – uusia määräyksiä

PIEneering
Parallel Image Engineering

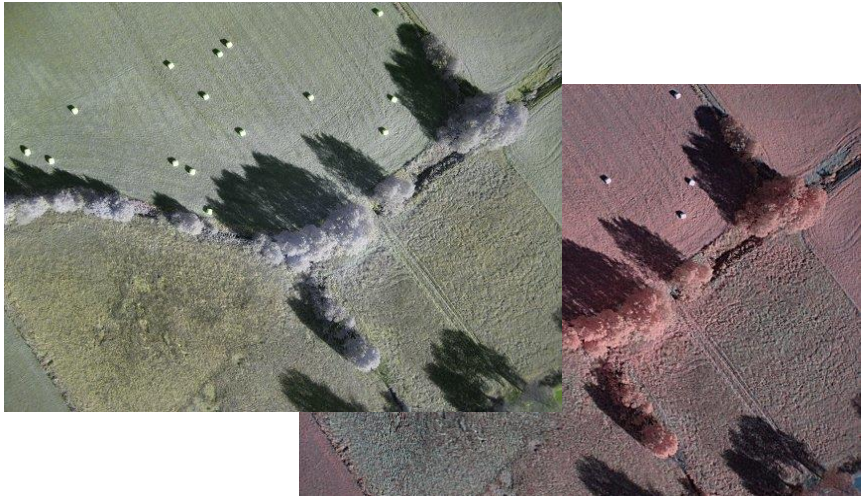
GPS-pisteet

- Vähintään 5 / lento
- Myös lentojen yhteiselle alueelle



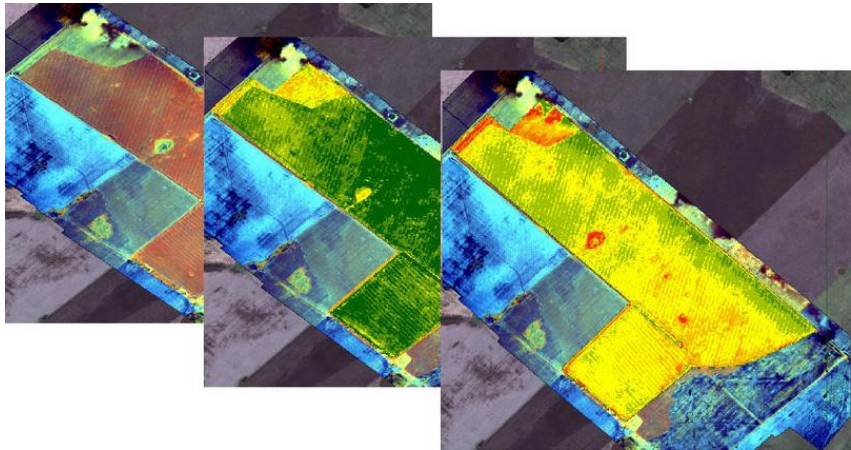
Kuluttajakamerat

- Pokkari, APS-C, SLR
- RGB / NIR
- 200g – 600g
- Monikamerajärjestelmät



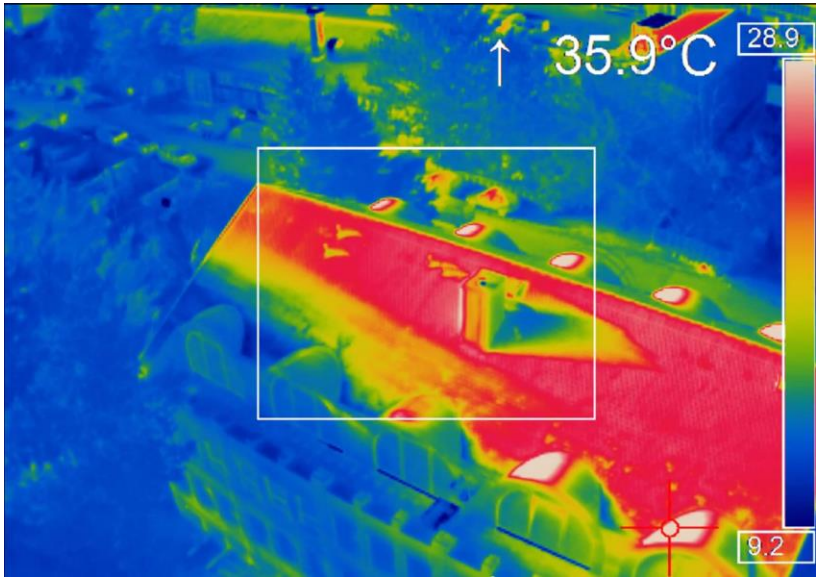
Monispektrikamerat

- Tetracam Mini-MCA 4/6/12
- 9.6 mm polttoväli
- 1.3 MB sensorit
- Mini-MCA6: 131.4 x 78.3 x 87.6 mm
- 600/700/1200 g



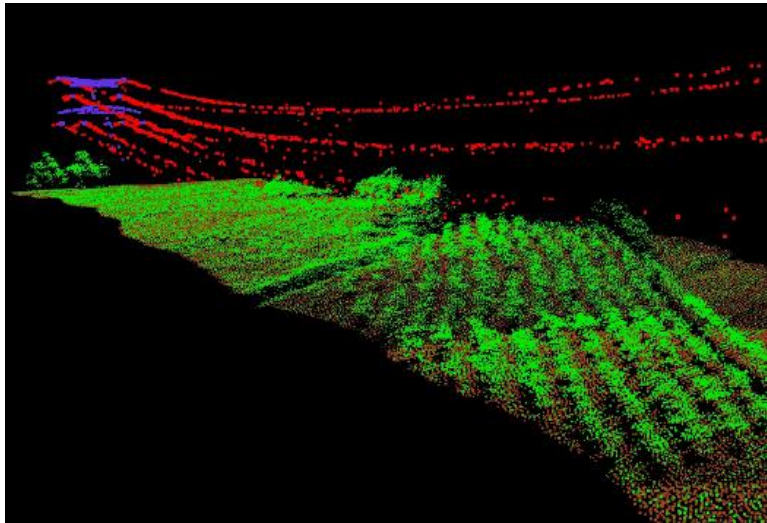
Lämpökamerat

- Optris PI400 / PI450
- Temperature range: -20° C to 1500° C
- Spectral range: 7,5 - 13 µm
- Frame rate: 80 Hz
- Optical resolution: 382 x 288 pixels
- Size: 45 x 45 x 62 mm
- Weight : 200 g



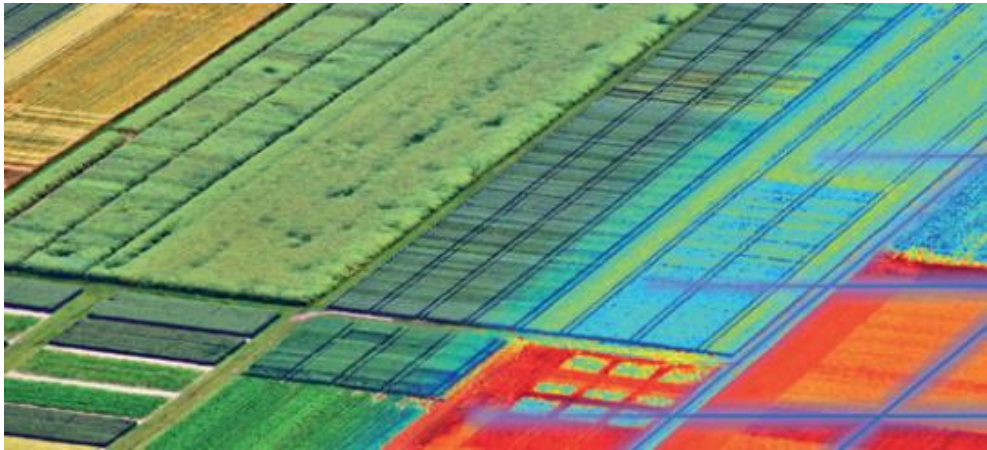
LIDAR

- Velodyne HDL-32E p
- +10.67 to -30.67 degrees FOV (vertical)
- 360° field of view (horizontal)
- Measurement range :1m - 80m
- 700 000 points / s
- Weight : < 2 kg
- Internal accuracy : +/- 2cm
- External accuracy : with kinetic GNSS post processing : +/- 10cm

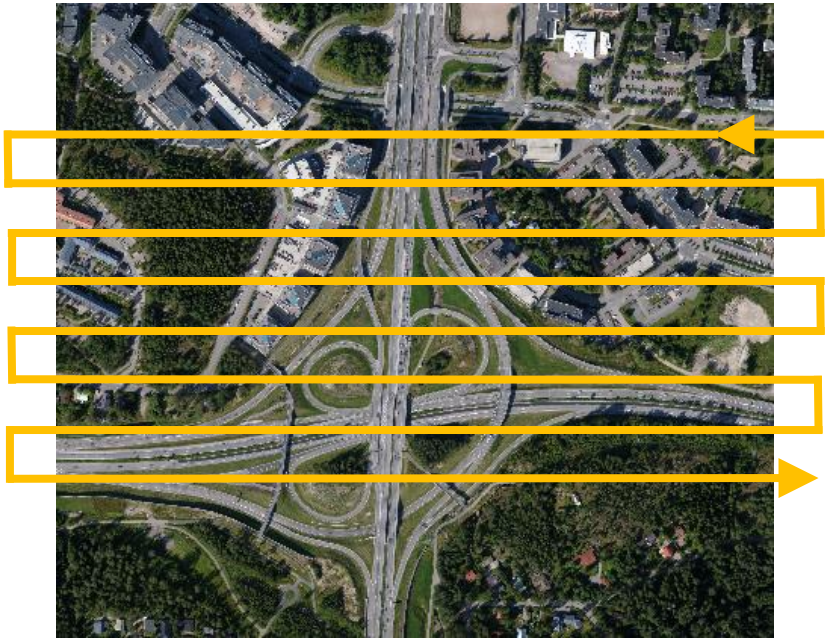


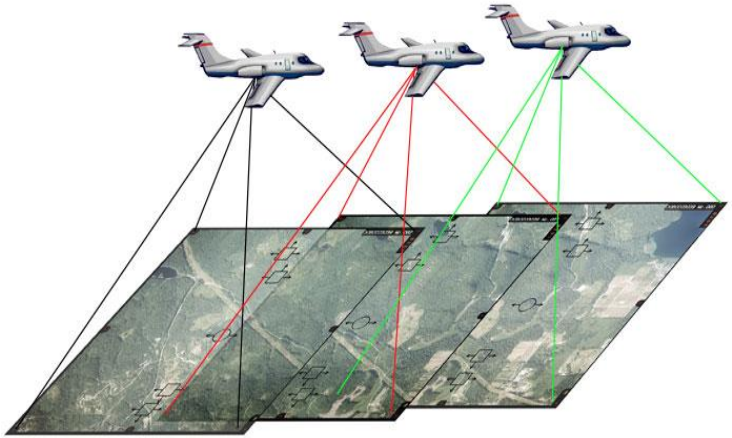
Hyperspektrikamerat

- Cubert UHD 185
- Wavelength range : 450 – 950nm
- Sampling interval : 4nm
- Spectral resolution : 8 nm @ 532nm
- Channels : 125
- Frames : 1Mb
- Weight : 840g



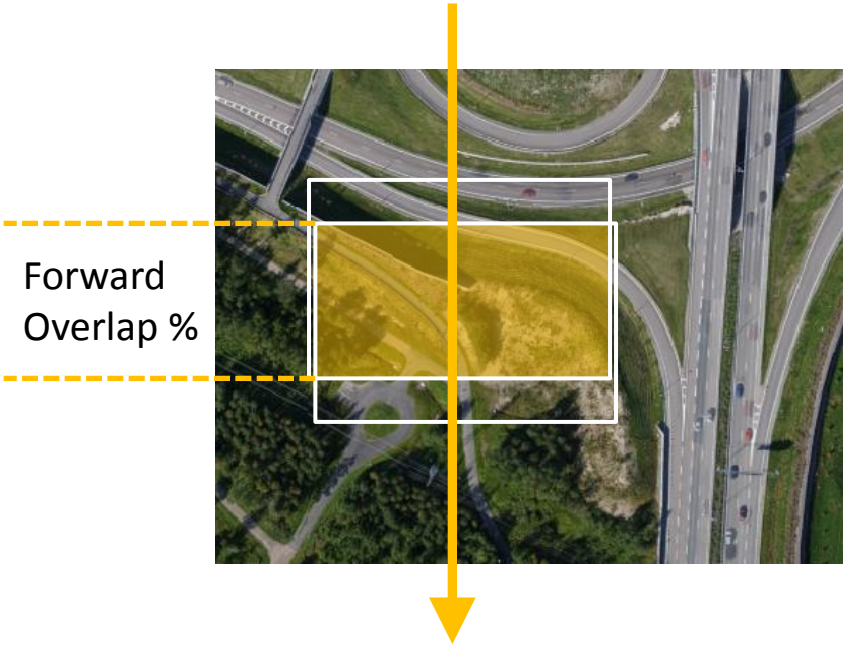
Kartoituslento

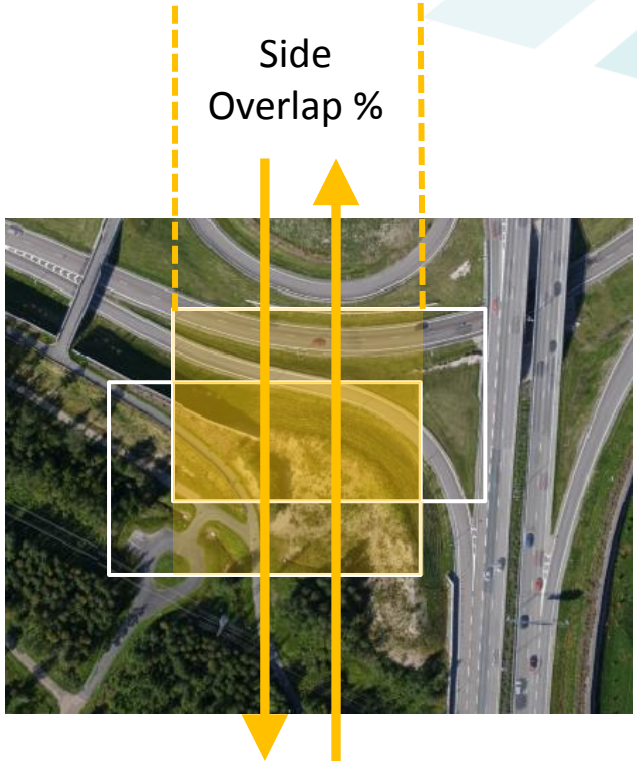




PIEneering
Parallel Image Engineering

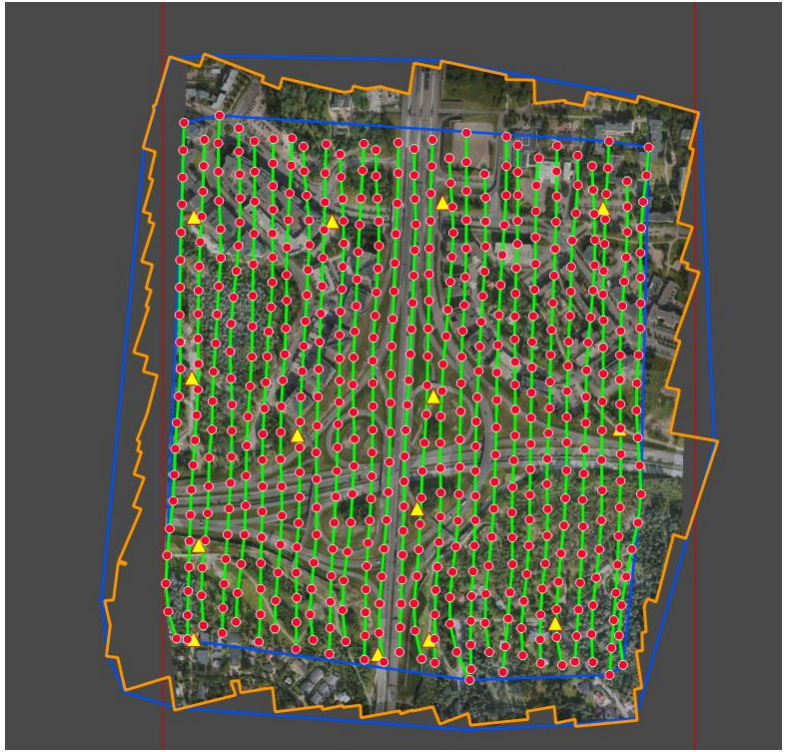
Kuvapeitot

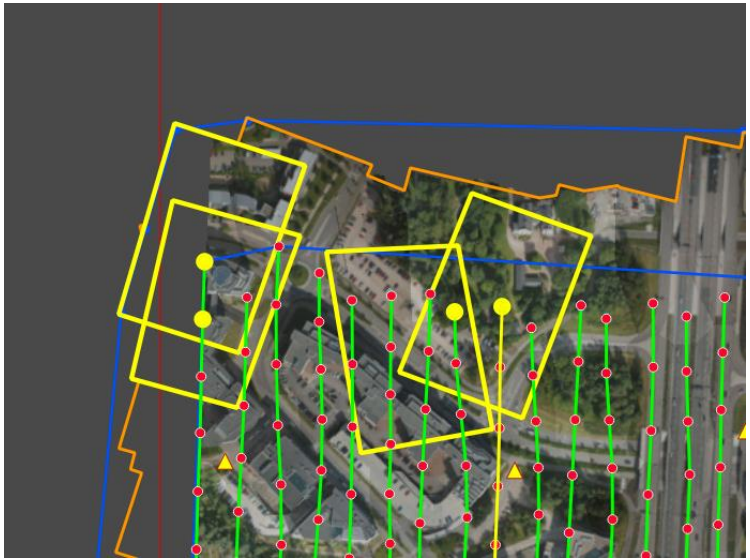




PIEneering
Parallel Image Engineering

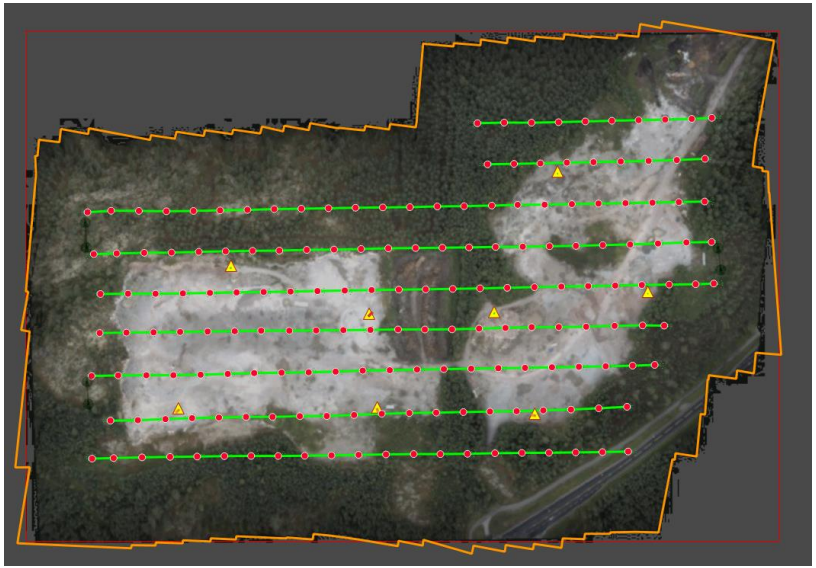
Kiinteäsiipinen

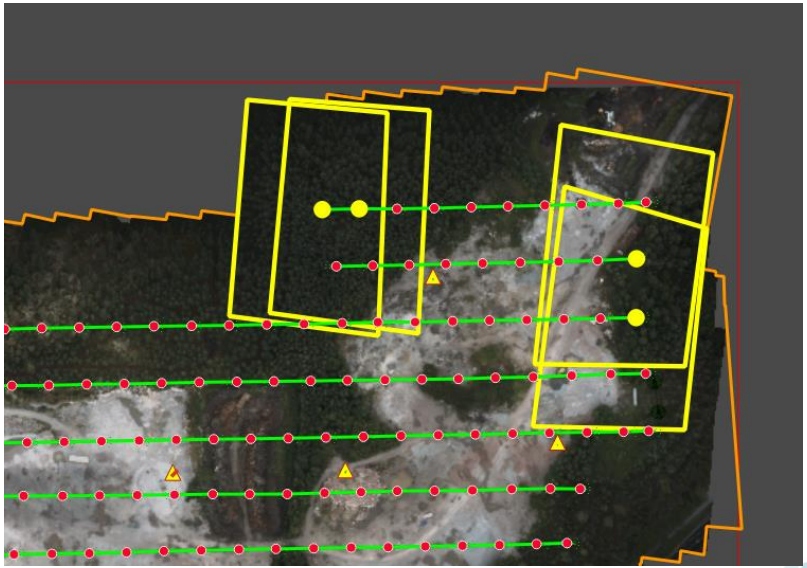




PIEneering
Parallel Image Engineering

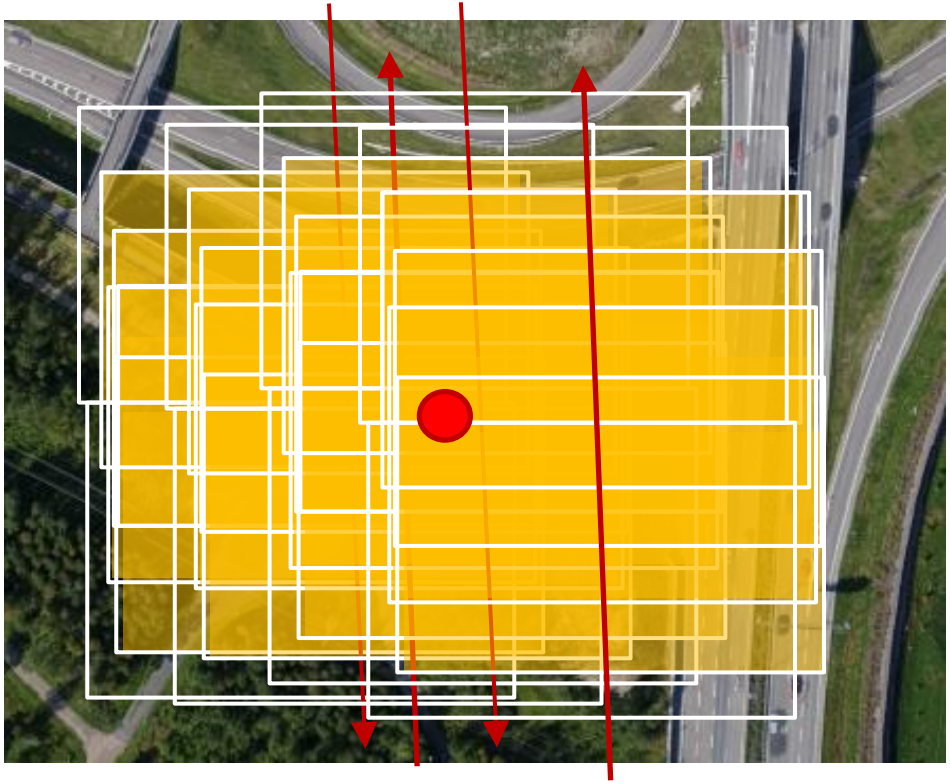
Pyöriväsiipinen





PIEneering
Parallel Image Engineering

Paljon redundanssia

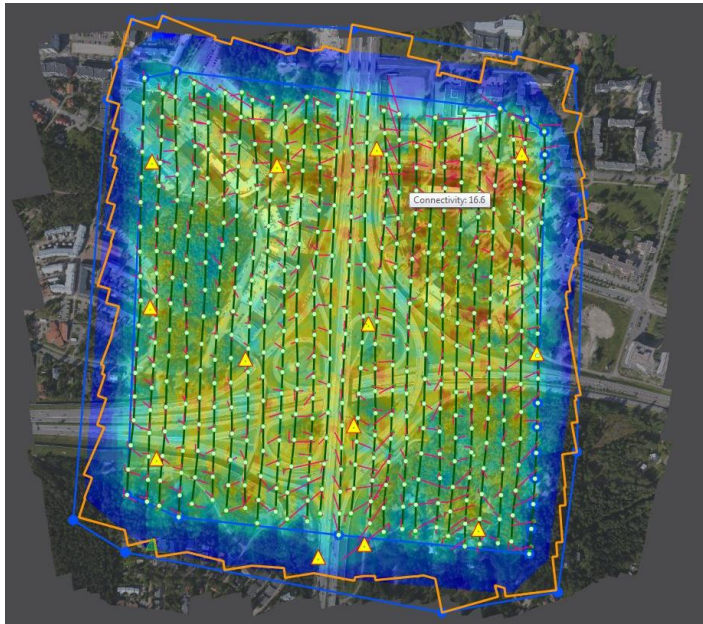


- Suuri kuvamäärä
- Tukeva blokki huolimatta halvoista GNSS/IMU komponenteista
- Mahdollistaa pintamallien laskennan

PIEneering
Parallel Image Engineering

Kuvien prosessointi

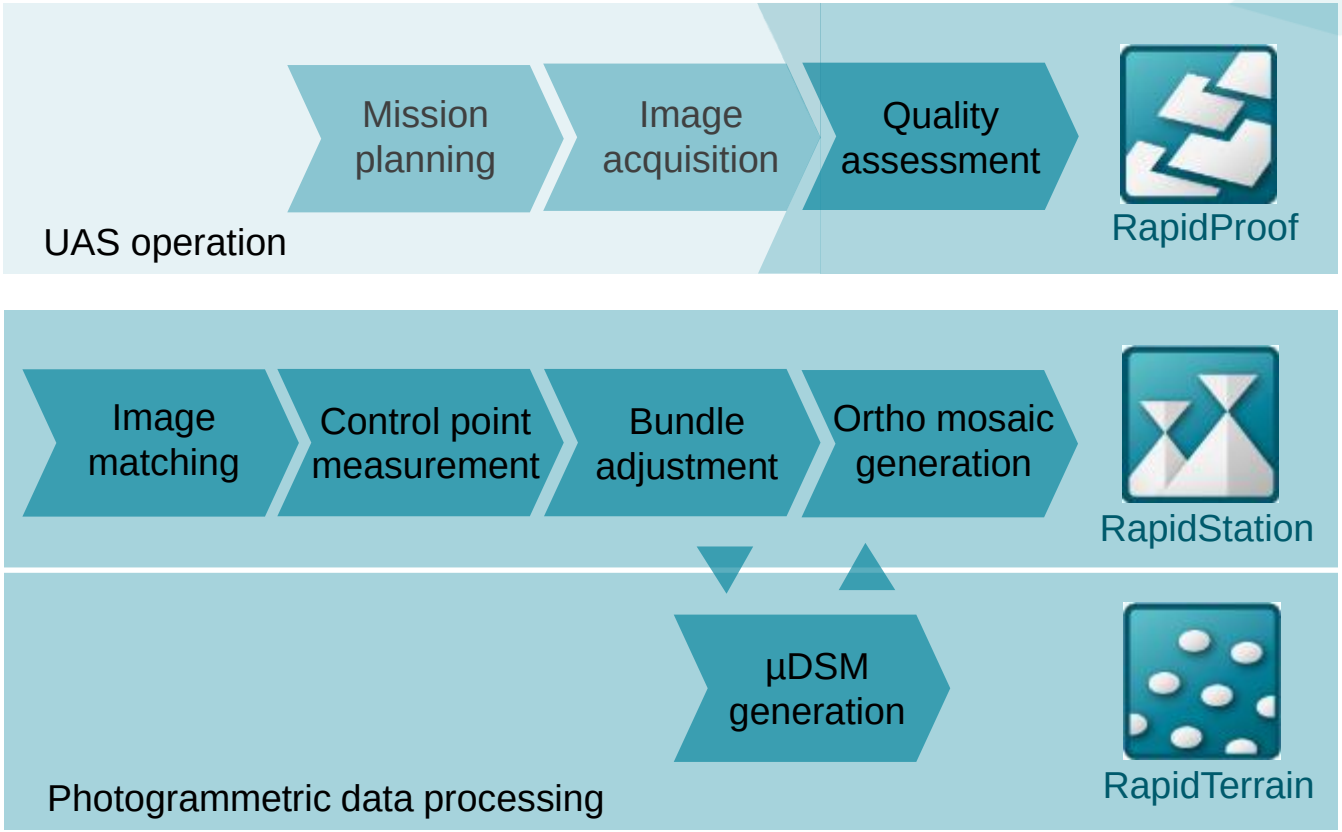
- Itse tehtynä / ulkoistettuna
- Tarkkuusvaatimukst
  - Pikamosaiikit
  - Mittatarkat tulokset



From

To

RapidStation ohjelmat



PIEneering
Parallel Image Engineering

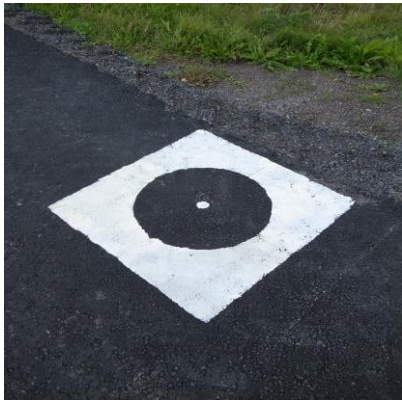
Tulokset

- ortomosaiikki
- 3D pintamalli
- Orientointitekijät stereokartoitusohjelmiin

PIEneering
Parallel Image Engineering

Tarkkuus

- Realistinen tarkkuus GPS-pisteillä
  - taso : 0,5-1 pixels
  - korkeus: 1-1,5 pixels
- Ilman GPS-pisteitä
  - taso : 0,5 – 1 m
  - korkeus: -



PIEneering
Parallel Image Engineering

Sovelluksia

- Infrarakentaminen (tilavuudet, projektiseuranta)
- Kunnan mittaustoimi (ortomosaiikit, stereokartoitus)
- Kaivosteollisuus (tilavuudet, projektiseuranta
- Ympäristötoimi (ortomosaiikit)
- Rakennusprojektit (ortomosaiikit)
- Kaupunkimallinnus (pistepilvet, bittikartat)

PIEneering
Parallel Image Engineering

Ortho mosaic from UAS data

City area DSM

DSM of a land fill site

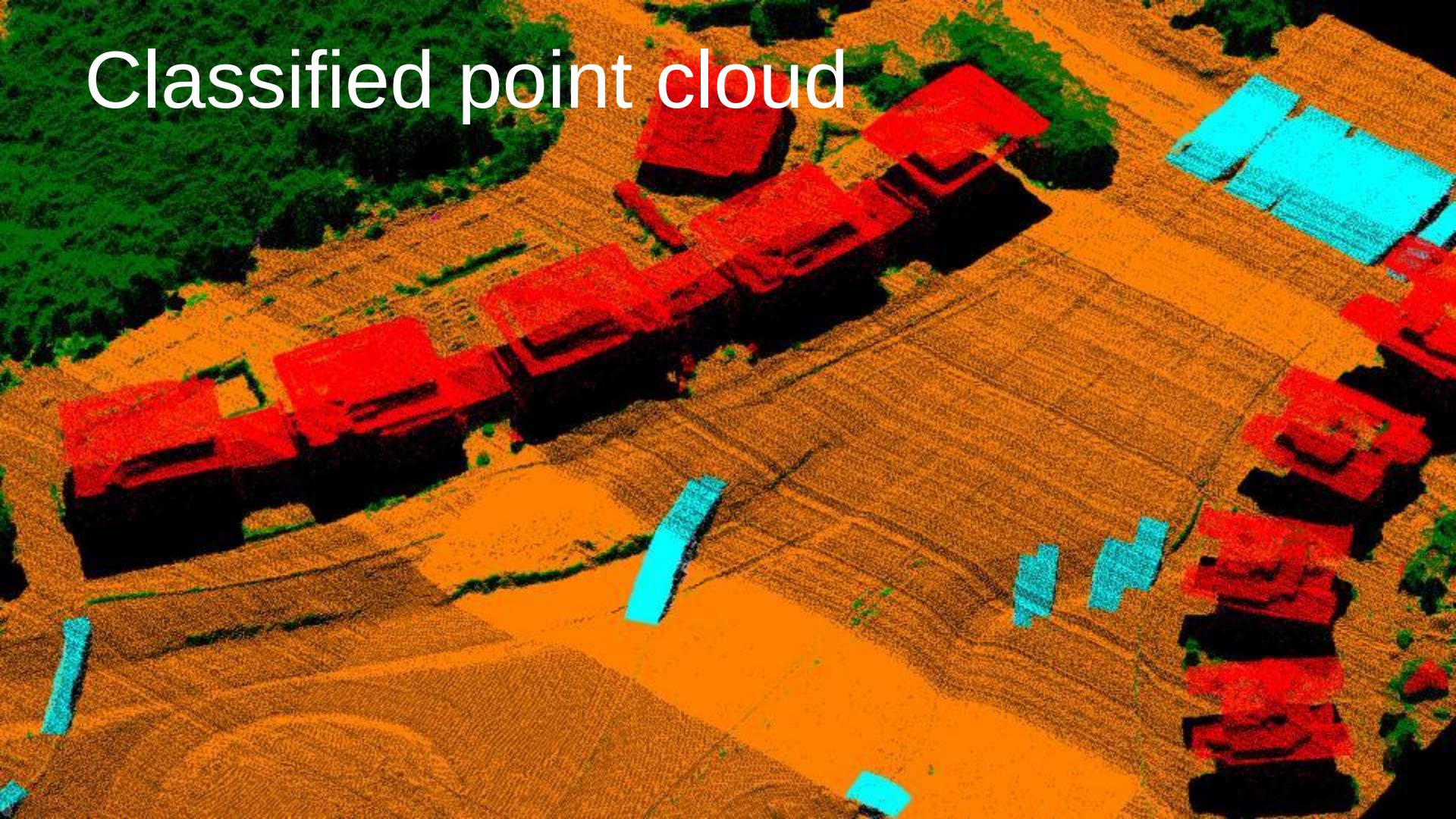
DSM of a step wall quarry

DSM of a ski resort

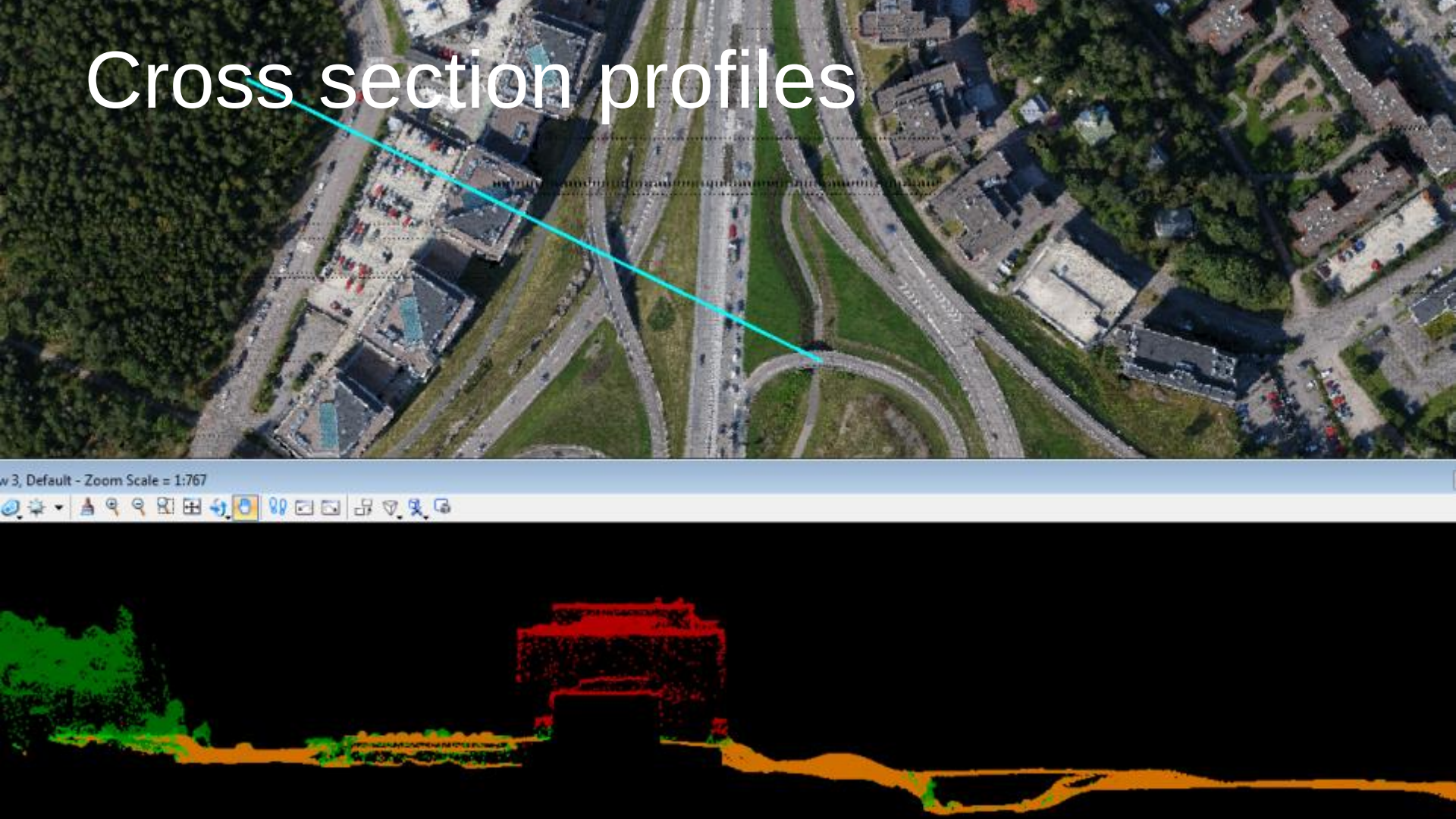
DSM of a road cutting site

DSM for city modelling

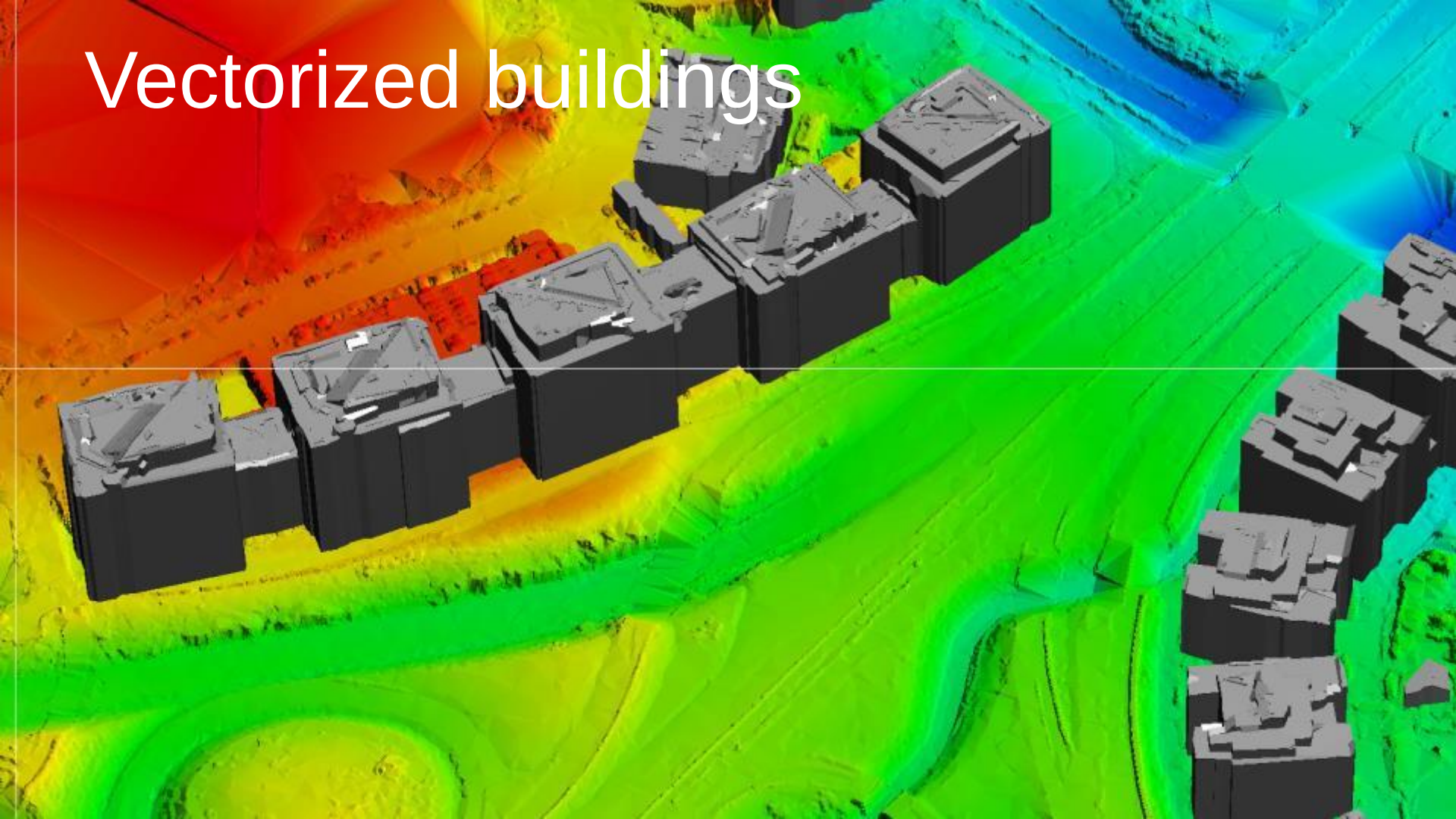
Classified point cloud



Cross section profiles



Vectorized buildings



Ortho draped over DSM

PIEneering

Parallel Image Engineering

MIKKO SIPPO | Managing Director

mikko.sippo@pieneering.fi
Tel. + 358 400 930 915

PIEneering Oy
Hylkeenpyytäjänkatu 1
00150 Helsinki, Finland

Tel. + 358 9 6219 0920
Fax + 358 9 6219 0921
www.pieneering.fi

PIEneering

Parallel Image Engineering