

Projekt 3D-FORINVENT

Radionica br. 1

Predstavljanje projekta



Primjena satelitskih snimaka visokih prostornih rezolucija u inventuri šuma



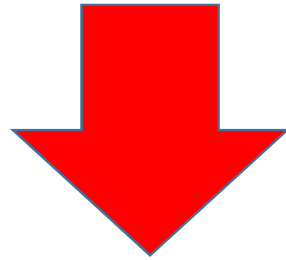
CILJ:

- razviti i testirati metode temeljene na različitim 3D optičkim podacima daljinskih istraživanja za primjenu u inventuri šuma
- poboljšanje učinkovitosti i ekonomičnosti postojećih terenskih načina prikupljanja podataka.

Metode:

- ispitati će se točnost proizvoda (aerosnimke, satelitske snimke, snimke bespilotne letjelice) izvedenih iz različitih 3D podataka DI i različitih prostornih rezolucija, za procjenu varijabli pojedinačnih stabala i šumskih sastojina na raznim prostornim razinama;
- istražiti će se i mogućnost njihove primjene u automatskoj segmentaciji i klasifikaciji pojedinačnih stabala i šumskih sastojina.

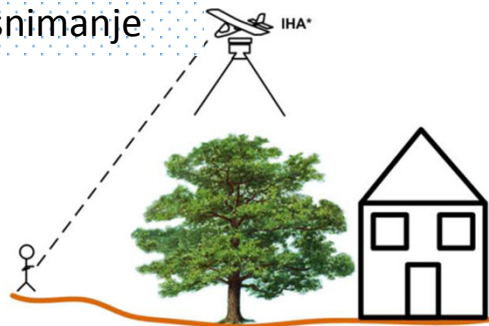
- 3D oblak točaka
- Digitalni model visina krošanja (DMVK)
- ortofoto



procjena glavnih varijabli pojedinačnih stabala i šumskih sastojina (visina, prsni promjer, temeljnica, drvni volumen, biomasa) na raznim prostornim razinama (stablo, ploha, sastojina).

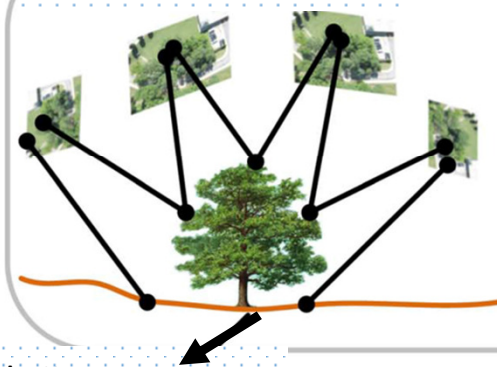
- satelitske stereo snimke predstavljaju potencijalni izvor za izvođenje 3D oblaka točaka i izradu DMVK te primjenu u inventuri šuma
- nove generacije satelitskih snimaka postižu prostornu rezoluciju (GSD - eng. Ground Sample Distance) od 30 cm (WorldView-3).
- prihvatljivija cijena, prednost satelitskih senzora je da pokrivaju veću površinu snimanja uz visoku učestalost snimanja, tj. uz visoku vremensku (temporalnu) rezoluciju.

snimanje

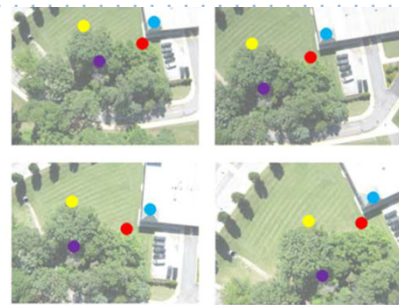


Generiranje oblaka točaka

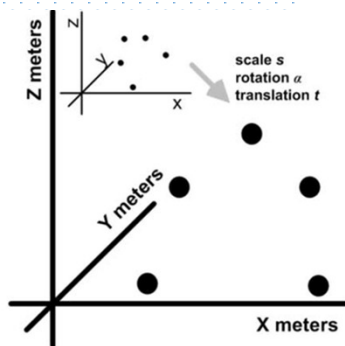
Usklađivanje snopa



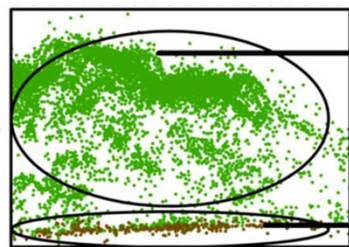
Automatsko prepoznavanje značajki



geokorekcija



filtriranje



Mjerenje

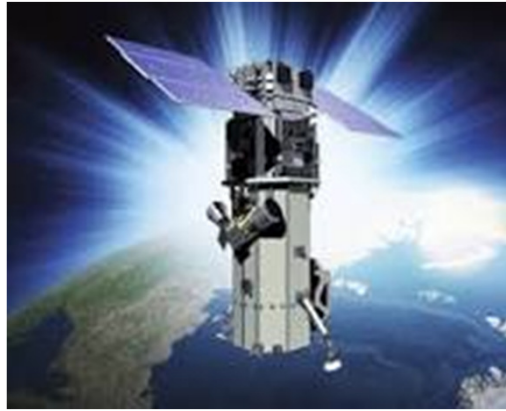
Vegetacije

- Min
- Max
- sredina

WORLDVIEW

- WorldView-1; 18. rujna 2007.
- WorldView-2; 8. listopada 2009.
- WorldView-3; 13. kolovoza 2014.
- WorldView-4; 11. studenoga 2016.

Worldview 3



- komercijalni satelit za promatranje Zemljine površine (Digital Globe)
- Leti u orbiti na visini od 617 km.
- Senzori:
 - PAN (450-800 nm) – 0,31 m. prostorne rezolucije
 - 8 multispektralnih (red, red edge, coastal, blue, green, yellow, near-IR1 and near-IR2) 400 nm - 1040 nm – 1,24 m prostorne rezolucije
 - 8 SWIR ([short-wave infrared](#)) : 1195 nm - 2365 nm – 3,7 m prostorne rezolucije
 - 12 CAVIS kanala: (desert clouds, aerosol-1, aerosol-2, aerosol-3, green, water-1, water- 2, water-3, NDVI-SWIR, cirrus, snow) 405 nm - 2245 nm – 30 m prostorna rezolucija

- 11-bitna radiometrijska rezolucija Pan i MS;
- 14-bitna radiometrijska rezolucija SWIR
- Vremenska rezolucija <1 dan
- Površina snimanja
- Mono: 66.5 km x 112 km
- Stereo: 26.6 km x 112 km

Pregled istraživanja

- 2013. godine ; Assessment of Cartosat-1 and WorldView-2 stereo imagery in combination with a LiDAR-DTM for timber volume estimation in a highly structured forest in Germany
- d'Angelo P., Reinartz P.. DSM based orientation of large stereo satellite image blocks, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci. , 2012, vol. 39 B1(pg. 209-214)
- Henrik J. Persson: Assessment of boreal forest height from WorldView-2 satellite stereo images Journal Remote Sensing Letters Volume 7, 2016 - Issue 12
- Kabir Peerbhay, Onesimo Mutanga, Romano Lottering, Riyad Ismail; Mapping *Solanum mauritianum* plant invasions using WorldView-2 imagery and unsupervised random forests Original Research Article, Remote Sensing of Environment, Volume 182, 1 September 2016, Pages 39-48
- Ruiliang Pu, Shawn Landry; A comparative analysis of high spatial resolution IKONOS and WorldView-2 imagery for mapping urban tree species Original Research Article, Remote Sensing of Environment, Volume 124, September 2012, Pages 516-533

- Verlič, A., Đurić, N., Kokalj, Ž., Marsetič, A., Simončič, P., Oštir K., 2014. Tree species classification using Worldview-2 satellite images and laser scanning data in a natural urban forest. Šumar list 138(9-10): 477-488.
- Yu, X., Hyyppä, J., Karjalainen, M., Nurminen, K., Karila, K., Vastaranta, M., Kankare, V., Kaartinen, H., Holopainen, M., Honkavaara, E., Kukko, A., Jaakkola, A., Liang, X., Wang, Y., Hyyppä, H., Kato, M., 2015. Comparison of Laser and Stereo Optical, SAR and InSAR Point Clouds from Air- and Space-Borne Sources in the Retrieval of Forest Inventory Attributes. Remote Sens 7(12): 15933-15954. doi:
- Pitt, D.G., Woods, M., Penner, M., 2014. A Comparison of Point Clouds Derived from Stereo Imagery and Airborne Laser Scanning for the Area-Based Estimation of Forest Inventory Attributes in Boreal Ontario. Can J Remote Sens 40(3): 214-232. doi: <http://dx.doi.org/10.1080/07038992.2014.958420>
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