vito
vision on technology

28/11/2014

Anaghlia

Analysis and Ground Truthing of Hyperspectral and LiDAR images in Archaeology

Project overview

ANAGHLIA is a spin-off from the former RAGALIRS project

Main objective:

→ to explore the use of **hyperspectral** and **LiDAR** data for the identification of ancient natural and cultural features.

Coordination:

- KULeuven → VITO

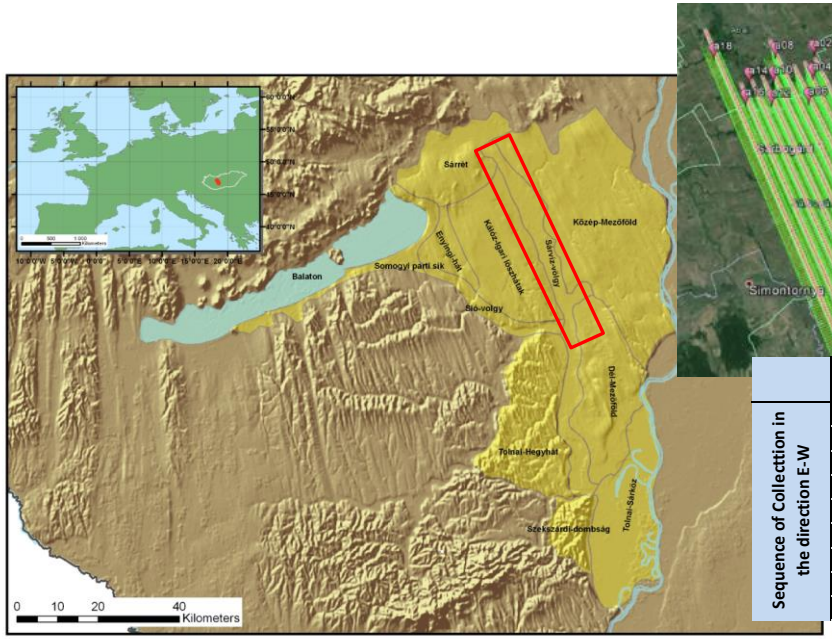
Partners:

- Groningen Institute of Archaeology (GIA)
  → Active in the Raganello catchment, Italy for many years.
- Institute of Geosciences, University of Mainz
  → Magnetometer measurements, geochemical analysis, etc.
- Hungarian National Museum (HNM)
  → Archaeologists, local partner

Study area

Sárvíz valley (Hungary)

- because of the abundance of archaeological features
- LiDAR data existed from the former ARMSRACE project (Eufar)
- On 16/04/2013 APEX imaging spectroscopy data was collected



	Flight line name (ANAGL130416_)	Line part in N-S direction	Recording time (local)
Sequence of Collecttion in the direction E-W	a02	0 - 4	10:47 - 10:53
	a04	4 - 0	10:58 - 11:04
	a06	0 - 4	11:10 - 11:16
	a08	5 - 0	11:22 - 11:29
	a10	0 - 4	11:34 - 11:40
	a12	4 - 0	11:45 - 11:51
	a14	0 - 4	11:58 - 12:04
	a18	0 - 4	12:24 - 12:30
	a16	5 - 0	12:10 - 12:18

Archaeological feature detection

- LiDAR data for DTM extraction
  - → used in archaeological prediction modelling (HNM)
- APEX data for archaeological feature detection
  - → 2 types:
    - ❖ Fragments of pottery, roof tiles, etc.
    - ❖ Altered soils, i.e. darkened soil due to ancient burn activities

Outcome & conclusions

Hyperspectral data could not be used for detecting the archaeological features in Sarviz

- High spectral resolution is needed as concluded from RAGALIRS
  - → Covered with soil and dust = spectral features are masked
- APEX spatial resolution (2 m) too coarse
  - → Archaeological features are small, i.e. few cm
  - → Sparsely scattered over the terrain
- Altered soils mixed up in the background due to the intense agricultural activities

Proposed alternative UAV with digital camera (3 cm)

- UAV RGB data fusion with APEX

  (Ref. Delalieux S., *et al.*, Unmixing Based Fusion of Hyperspatial and Hyperspectral Airborne Imagery for Early Detection of Vegetation Stress. JSTARS.)

  - → Same conclusion as above

Outcome & conclusions

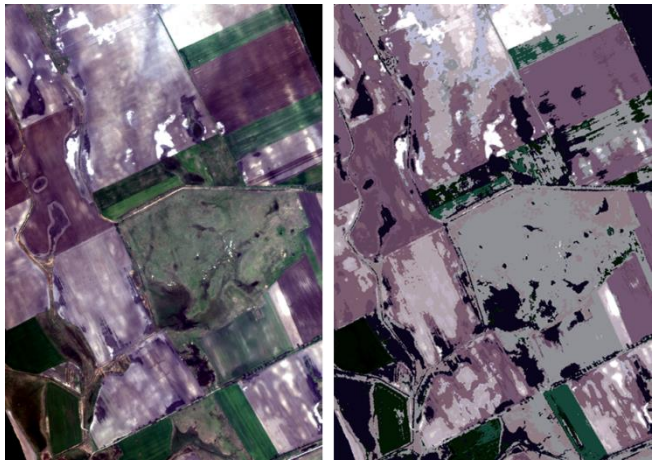
1. Unsupervised endmember extraction optimization for soil mapping

→ Ref. The Spatial/Spectral Iterative Rule based Endmember Extraction algorithm (SSIREE), Remote Sensing, (paper in preparation)

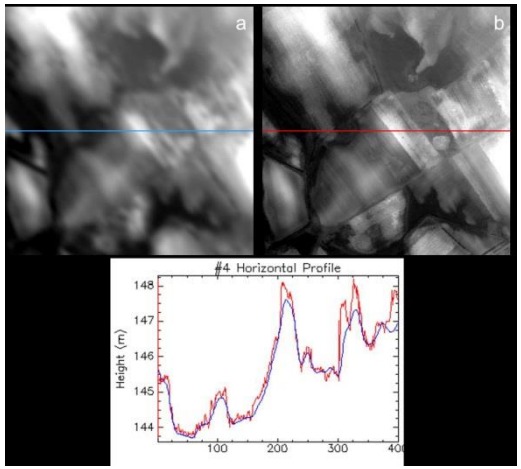
2. Improved DTM extraction from LiDAR

→ Ref. DTM retrieval by multidirectional convolution height filtering, Remote Sensing, (paper in preparation)

1



2



→ Soon available at: Colibri The ENVI/IDL Code Library

Ref. http://sourceforge.net/p/enviidlcodelibr/wiki/Home/