



Examining the potential of stereo image interpretation in Hungary

1st part



Institute of Geodesy, Cartography and Remote Sensing
20th MARS Conference



Stereo workstations at the Directorate of Remote Sensing and
Satellite Geodesy/Department of Photogrammetry



PLANAR monitors




Stereo workstation at the
Directorate of Geoinformation





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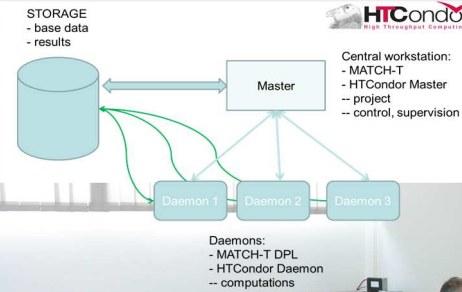

2




**2 stereo workstations
+ SummitEvolution(DAT/EM) – ArcGIS at
Directorate of Agriculture and Rural
Development**



**Computing workstations at Directorate of
Remote Sensing and
Satellite Geodesy/
Department of Photogrammetry**

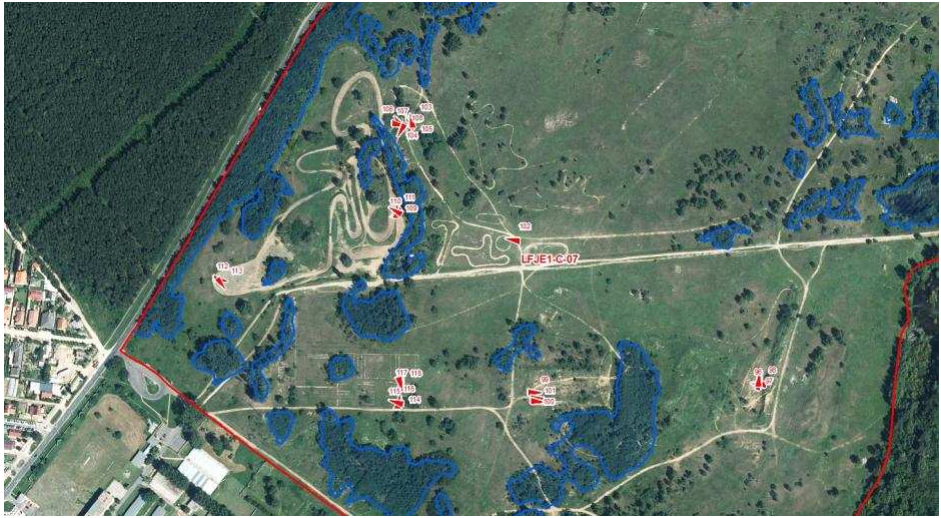






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3

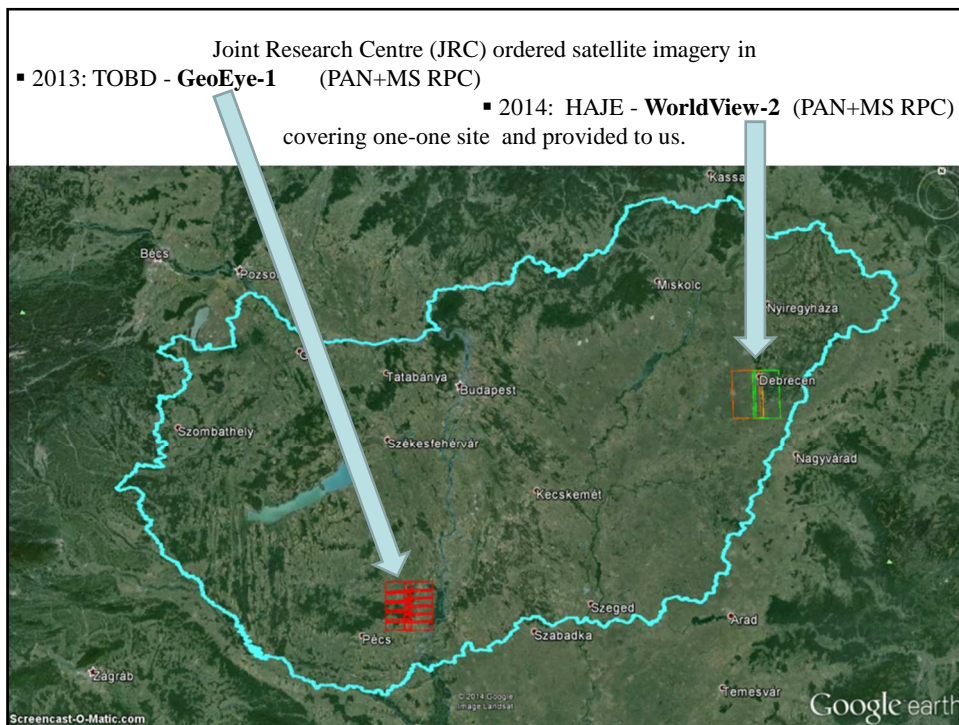
StePI (Stereo Pilot) – LPIS
Position and direction of photos made in pursuance of RFV (Rapid Field Visit)





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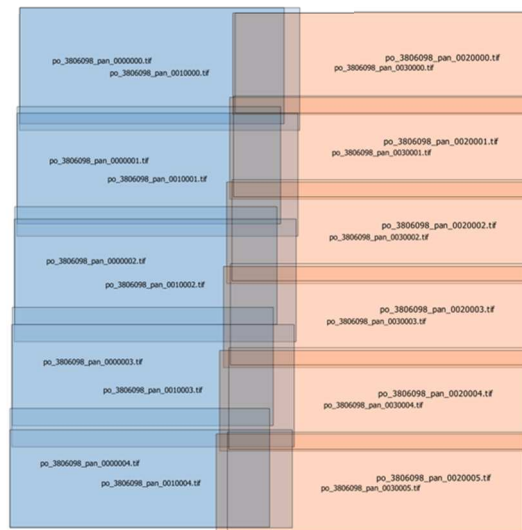
4



1st step was the geometric analysis of stereo imagery

Bundle block adjustment of GeoEye-1 stereo satellite imagery

The site area was sampled in two passage, days 03.07.2013. and 22.07.2013., same pass stereo images were recorded in each passage, images were segmented to five parts (western zone) and six parts (eastern zone).



block scheme



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7

Bundle block adjustment

- Trimble/Inpho
- Erdas Imagine/LPIS 2013
- BAE Systems Socet GXP 4.1

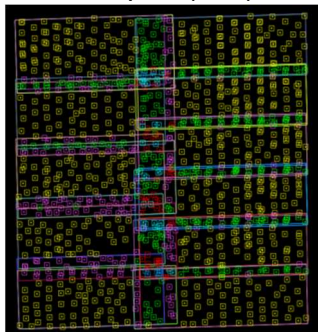


2014.11.10. 15:15

New major Inpho version 6.0 releases with Satellite Triangulation functionality

1.1. **Pan-Sharpening** was performed as the first step of the workflow, further processing steps were based on the output of it.

1.2. **Automatic tie points (~1500) measurement**



Example of previously used resolution merge technique (left) and **Gram-Schmidt pan-sharpening** (right)



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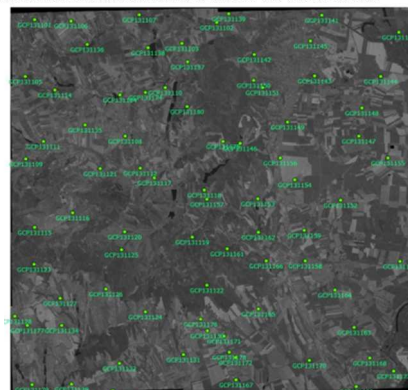
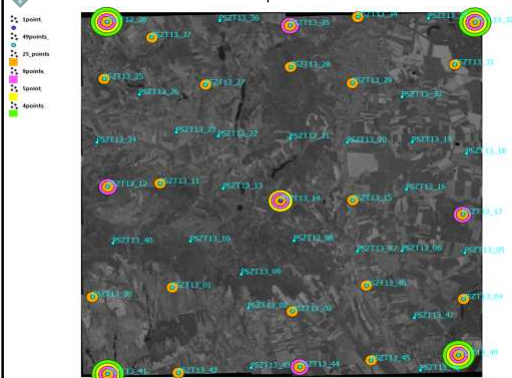
8

2. Ground control point measurement and bundle block adjustment

We prepared several ground control point configurations to investigate the adequate (minimal) number of GCPs to achieve JRC accuracy recommendations and also fits to the geometrical framework of FÖMI. Bundle block adjustment with the following ground control point configurations were tested:

- 79 RTK/GNSS measured ground control points (defined by traditional photogrammetric theory) across the block on site

- 49 ground control points,
- 25 ground control points,
- 9 ground control points,
- 5 ground control points,
- 4 ground control points,
- 1 ground control point defined and measured in stereo from aerial stereo pairs

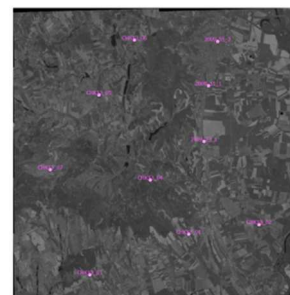


9

3. Geopositional accuracy of independent check points

RMS values after adjustment:

	RMS x	RMS y	RMS z	Total RMS
Geopositional accuracy of stereo measurements using original RPC data	± 0.268 m	± 1.790 m	± 0.447 m	
Block adjustment involving 79 RTK/GNSS GCPs	± 0.319 m	± 0.296 m	± 0.252 m	± 0.503 m
block adjustment involving 49 control points, defined and measured in stereo	± 0.205 m	± 0.202 m	± 0.206 m	± 0.353 m
block adjustment involving 25 control points, defined and measured in stereo	± 0.196 m	± 0.183 m	± 0.171 m	± 0.318 m
block adjustment involving 9 control points, defined and measured in stereo	0.186 m	0.170 m	0.158 m	0.297 m
block adjustment involving 5 control points, defined and measured in stereo	± 0.184 m	± 0.231 m	± 0.127 m	± 0.322 m
block adjustment involving 4 control points, defined and measured in stereo	± 0.172 m	± 0.470 m	± 0.213 m	± 0.544 m
block adjustment involving 1 control points, defined and measured in stereo	± 0.612 m	± 0.620 m	± 0.988 m	± 0.877 m



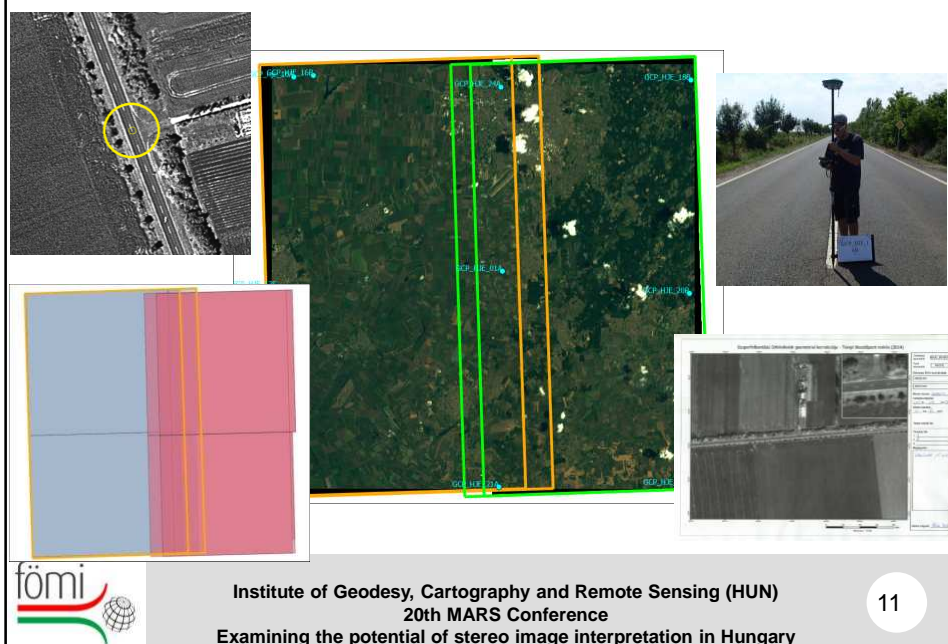
After block adjustment was completed in SGXP for each GCP configurations and RPC coefficients metadata was generated for each adjustment, we investigated geopositional accuracy of 10 **independent check points** by importing imagery and their adjusted _RPC data to DAT/EM Summit Evolution and measured check points in stereo



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10

2014: HAJE – WorldView-2 PAN+MS RPC satellite imagery



Summary of space-photogrammetric investigations

Based on our investigations we can state that


- GeoEye-1 satellite imagery block adjustment **is possible** in BAE Systems Socet GXP and hopefully with Trimble/Inpho Match-AT.
- In SGXP refined RPC metadata can be generated, imagery can be loaded to other applications with these refined metadata for further stereo processing and necessary precision can be achieved.
- **Required accuracy can be achieved processing stereo satellite imagery.**
- Even the **ground control points defined and measured from aerial stereo imagery in photogrammetric stereo can be used** instead of RTK/GNSS on-site measurements with the same reliability.
- **The number of ground control points can be greatly reduced.**



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12

Stereo photogrammetry & the **CAP** reform



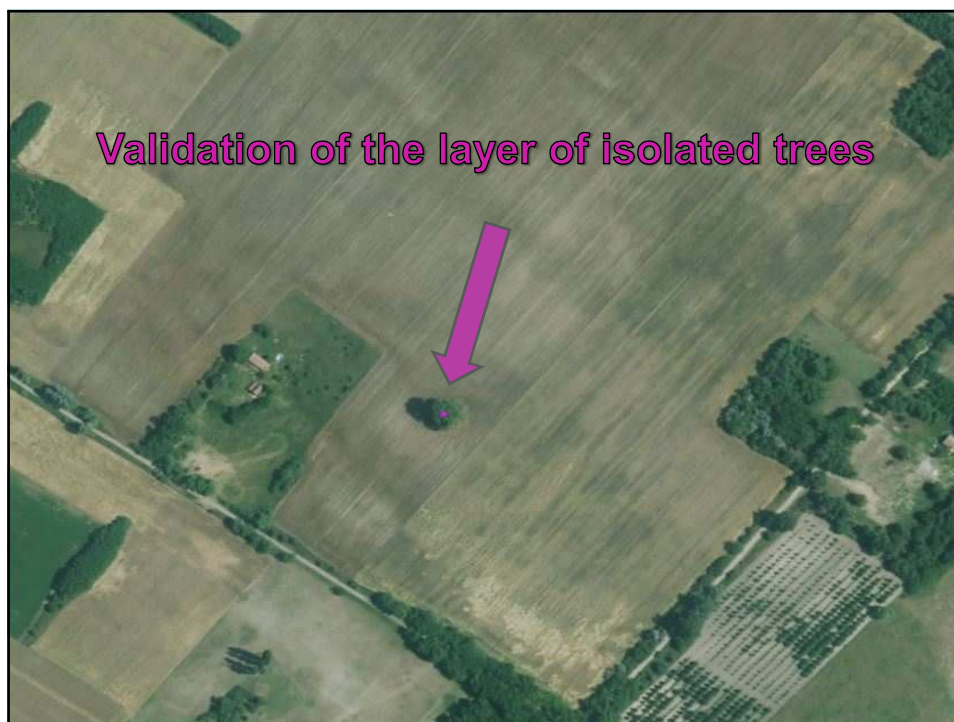
Greening

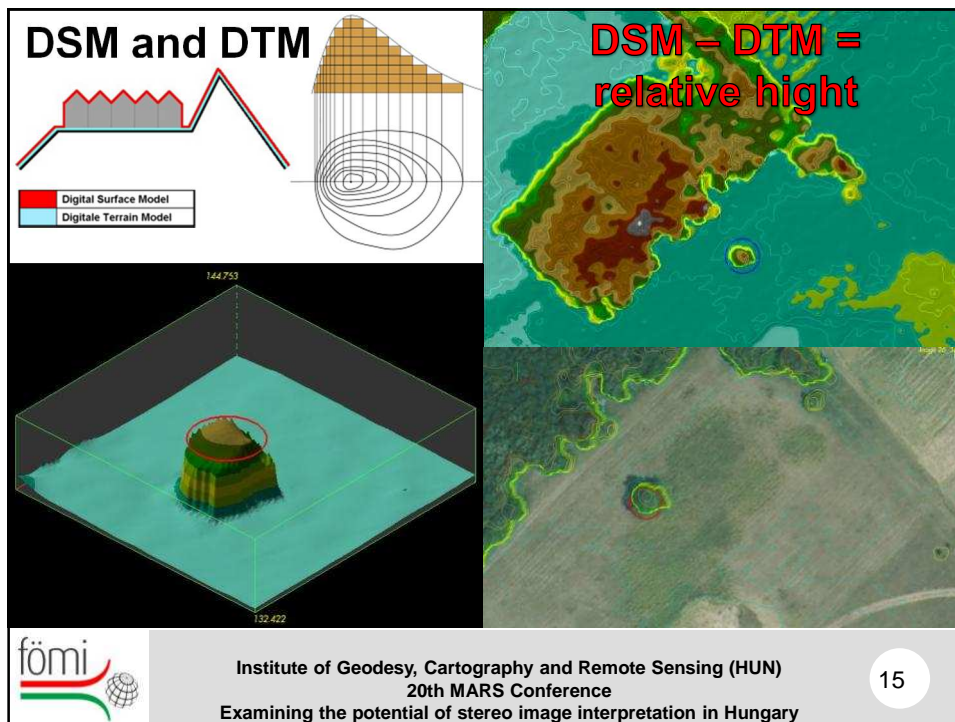
- Isolated trees
- Trees in line
- Group of trees and shrubs
- Wooded strip
- Terraces

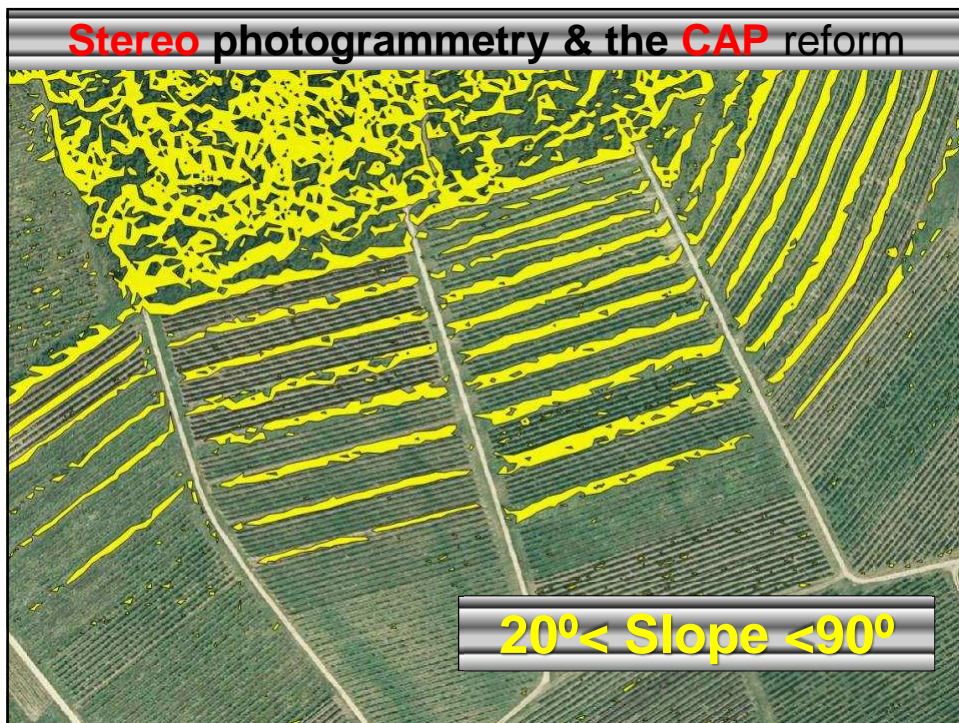
fömi 

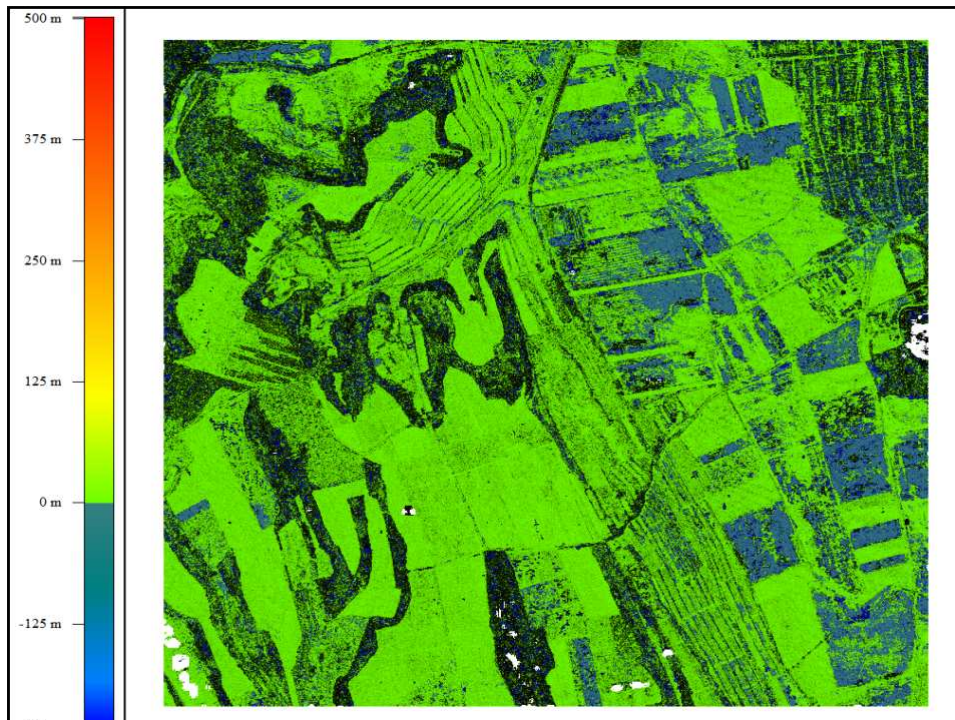
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13












Thank you for your attention.



After the session join our party ☺ and let's see some stereo visualisation!



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20