# 7th ADVANCED TRAINING COURSE ON LAND REMOTE SENSING

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# DIGITAL SURFACE MODEL PRODUCTION AT THE GOVERNMENT OFFICE OF THE CAPITAL CITY BUDAPEST, DEPARTMENT OF GEODESY, REMOTE SENSING AND LAND OFFICES.

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## POSTER ABSTRACT

In this poster an introspection is presented to the working phases of multiple sensor and multi scale digital surface model production at the Government Office of the Capital City Budapest, Department of Geodesy, Remote Sensing and Land Offices,Remote Sensing Unit, Photogrammetry Group (previously known as Institute of Geodesy, Cartography and Remote Sensing, FÖMI ). Photogrammetry (FO) started its operation as a smaller photogrammery working group within the framework of the Building Monitoring System project, in 2013. The group was a reorganization and reunion of the facilities (e.g. human resources, hardware and software) that had already existed for several decades in FÖMI. Tasks of the group includes photogrammetric support of CwRS and LPIS, monitoring and quality assurrance of aerial image aquisition campaigns and final ortho and aerial imagery products, VHR satellite image processing (block adjustment, ortho product creation and stereo processing).

## OBJECTIVES

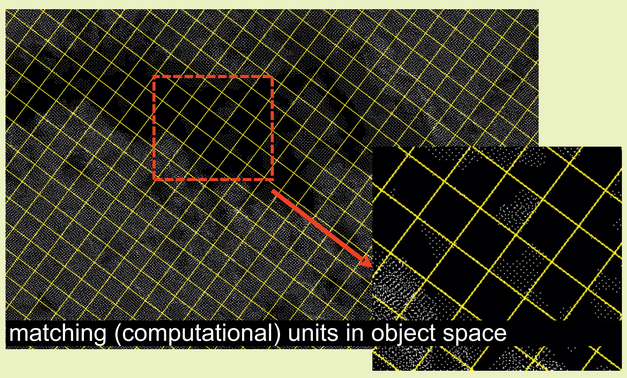
In **LPIS** (Land Parcel Identification System) and **CwRS** (Controls with Remote Sensing) campaigns a large number of aerial and satellite images are used and archived. This archive makes it possible to build a country-wide database of surface elevations as a secondary outcome besides traditional ortho production using imge matching techniques. This digital surface model database carries valuable information for long term surface change detection.

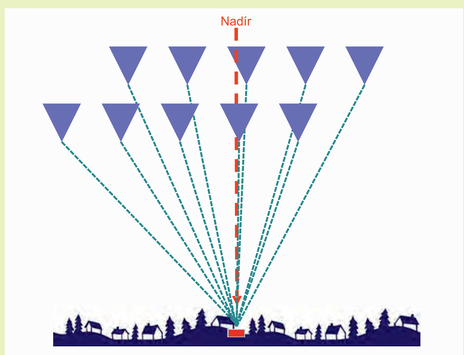
Direct point cloud interpretation for easy land cover analysis.
Future objective: country-wide streaming point clouds on the web.

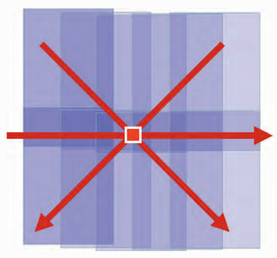
## APPLICATION ENVIRONMENT

**Input data**
- Block adjusted aerial images with camera and exterior orientations
- VHR stereo imagery with corrected geopositional accurracy
- Premeasured geomorphological vector data (if applicable)
- Working area definitions

**MatchT processing phase (Trimble/Inpho)**
In this phase the actual surface generation is done. Various parameters are chosen for customized setup for best adatption to surface type and source imagery type. In this step the multi image matching is carried out through the image pyramids of available stereo pairs, resulting in extremely large number of irregularly distributed surface points. This point cloud is then used to generate a grid based elevation model or fused point cloud for post processing. Computation is done in matching units defined in object space. Feature based and area based image matching techniques are used and also cost based matching at the highest resolution level. LSM refinement and several filtering techniques are available and also many parameters can be setup manually ( max parallax, operator dimension, etc.). One matching thread is processed for one working area defined in input, and can be assigned for a processing node in the multicore processing grid.

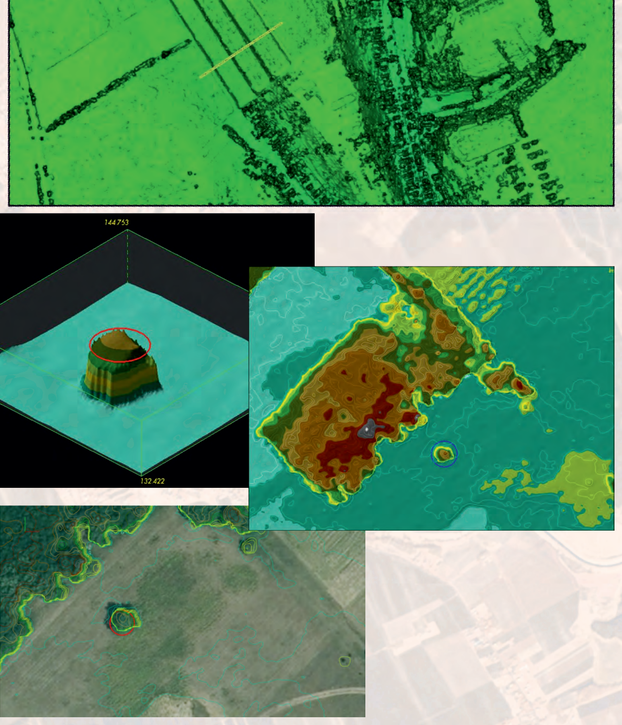


Model selection


Surface model based on analog scanned imagery, 2000


Surface model based on digital aerial camera imagery, 2015

The 3D analysis and classification of DSMs and nDSMs are ready to produce additional layers to OBIA (Object Based Image Analysis) and land cover classification processes.



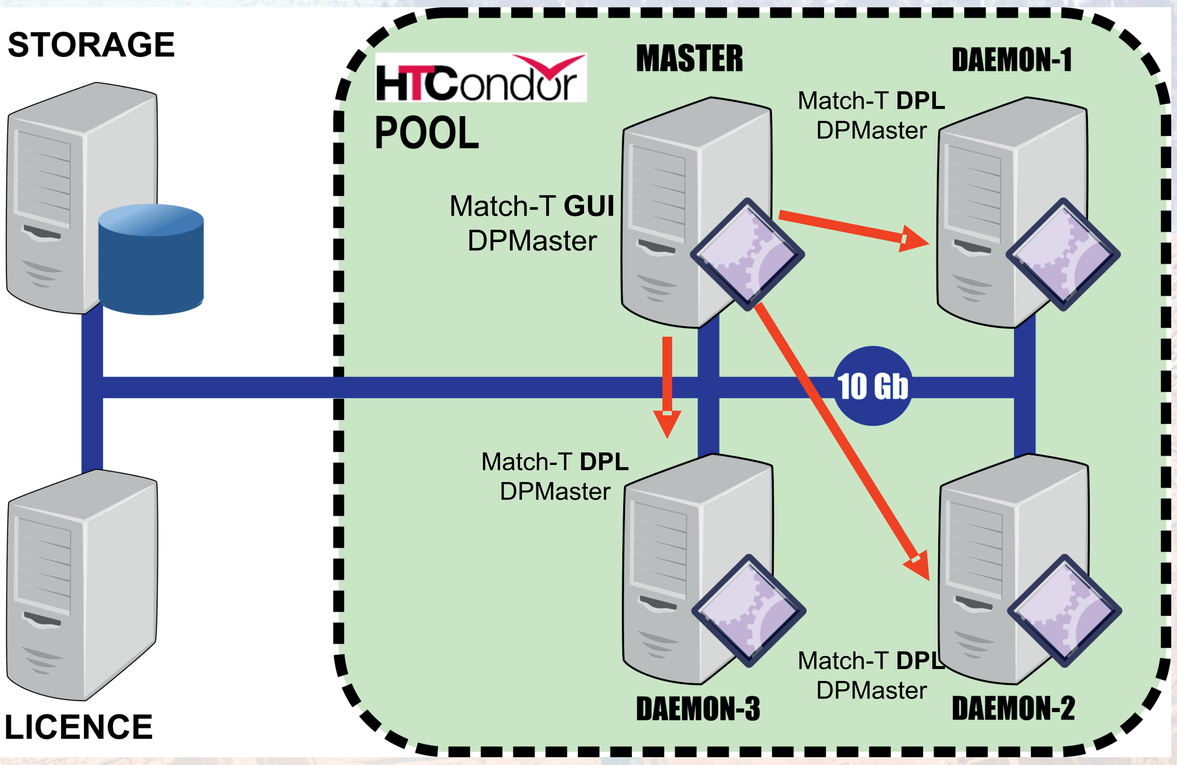













**HTCondor Pool**
An individual matching thread (processing of a working area) is processed on a daemon in the condor pool guided by the condor pool master node.

GOVERNMENT OFFICE OF THE CAPITAL CITY BUDAPEST

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