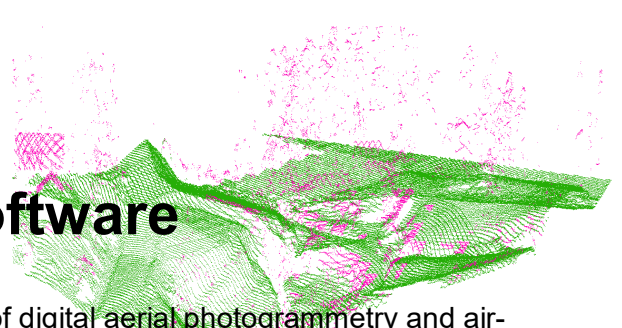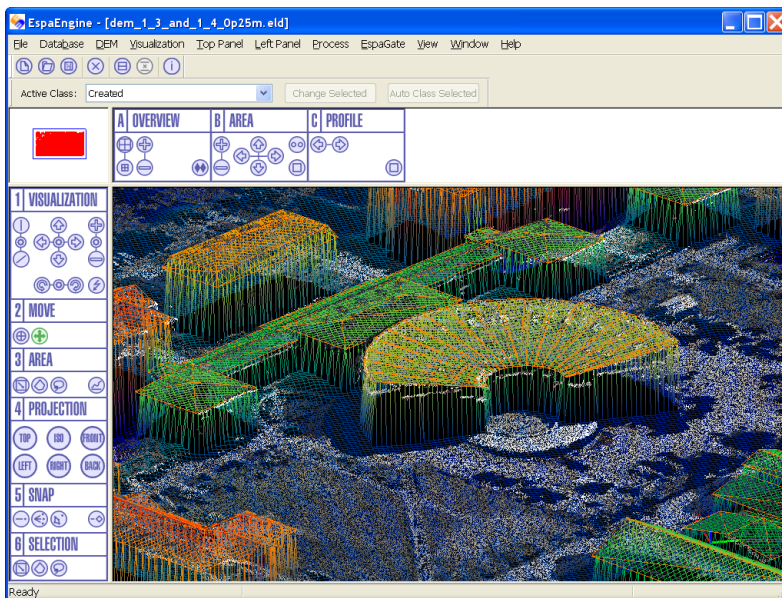# ESPA Systems
Photogrammetric & LIDAR Software

ESPA Systems offers you the latest developments in the field of digital aerial photogrammetry and airborne LIDAR data processing. Our products are made of innovative software solutions combined together with modern digital technology. Take a closer look at the key features inside ESPA Systems software and think how your organisation could benefit from this functionality.

ESPA Systems software supports completely digital flow of work

- ESPA Systems software is designed for digital aerial triangulation (EspaBlock, EspaBundle), digital orthophoto production and mosaicking (EspaOrtho), stereoscopic 3-D data acquisition (EspaCity, EspaGate, EspaKernel) and processing of georeferenced airborne LIDAR data (EspaEngine).

- ESPA Systems product concept separates production from use of digital aerial images. The concept opens stereoscopic 3-D data acquisition to ever-increasing group of users. Our EspaGate application ties tightly together 3-D stereoscopic work and spatial data maintenance in the GIS environment.

- ESPA Systems software supports completely digital flow of work, from digital imaging to the stereoscopic viewing with the latest digital viewing technologies.
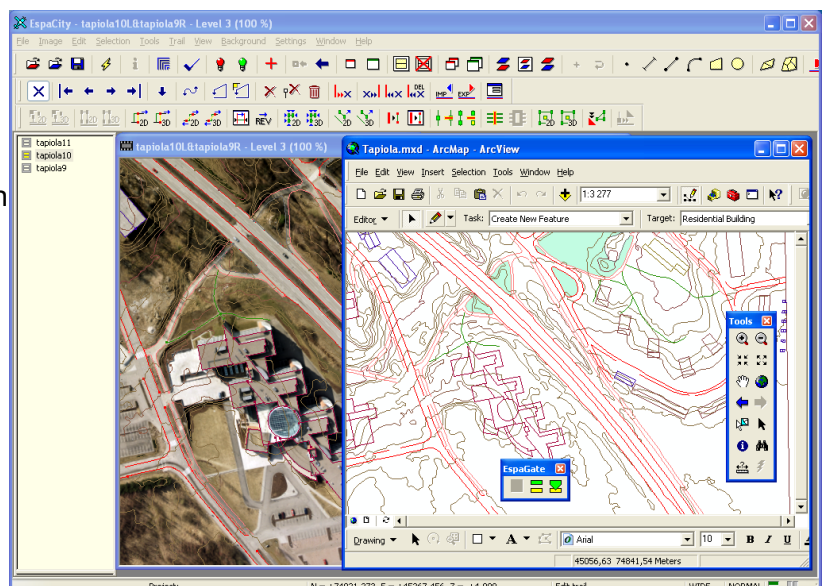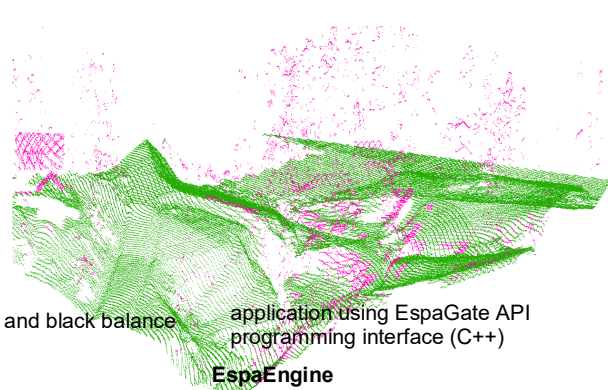

EspaCity for spatial data maintenance

- Use EspaCity for stereoscopic 3-D mapping of spatial objects like buildings, roads and terrain forms from digital aerial imagery.

- Check and maintain the content of your spatial database using EspaCity and EspaGate.

- EspaGate connects EspaCity stereoscopic 3-D data collection directly to your GIS environment.

- EspaGate connection is available for all major GIS products, in addition, you can develop your own EspaGate application using EspaGate API library written with C++.

EspaEngine for airborne LIDAR data

- Manage and process huge georeferenced point data sets i.e. point clouds in EspaEngine.

- Compute large continuous grid elevation models and use this functionality to classify georeferenced point data automatically.

- Check and classify point data stereoscopically on digital aerial images.

- Visualise grid elevation models and point data in free viewing angles with various techniques including wrapping of digital images over elevation model.

Key Features

EspaKernel

- Create and manage image sets and frames
- Combine image data and orientations
- Read and write RAW images
- Read and write TIFF images
- Read and write BigTIFF images
- Read and write JPEG images
- Read and write tfw format files
- JPEG image compression inside TIFF images
- GZIP image compression inside TIFF images
- Create tiled images
- Rotate, flip and swap images
- Sharpen images
- Create image pyramids
- Create block overview mosaics
- Combine image from separate channels
- Split image to separate channels
- Combine image pyramids to one file
- Define stereo pairs
- Compute epipolar images
- Transfer orientations (MATCH-AT)
- Transfer EnsoMOSAIC orientations
- Transfer Bingo orientations
- Transfer ISDM (ImageStation Digital Mensuration) orientations
- Create artificial points for orientation transfer

EspaBlock

- Prepare triangulation work using project wizard
- Measure fiducial marks automatically
- Measure tie points automatically
- Measure and edit points visually
- Adjust tones automatically
- Compute blocks efficiently using bundle adjustment program included (EspaBundle)
- Utilize iterative flow of working in triangulation
- Use approximate image orientations to guide image measuring
- Visualize adjustment results

EspaBundle

- Use aerial film cameras
- Use aerial digital cameras like Ultracam and DMC
- Use multiple observation files
- Define interior orientation (focal length, the location of principal point in the image plane, lens distortion)
- Compute fiducial mark transformation with 6-, 8,- or 12- parameters
- Correct effects of earth curvature and refraction
- Compute approximate values using 4-parameters transformation (Helmert transformation)
- Compute bundle adjustment
- Adjust with XYZ-, XY- and/or Z-known control points
- Adjust with distance observations
- Adjust with GPS observations and drift parameters
- Adjust with additional parameters (self calibration)
- Write orientation parameters
- Write accuracy estimates
- Write adjustment report

EspaOrtho

- Define orthophotos from input imagery
- Compute terrain grids for orthophotos from random points or existing terrain grids
- Rectify imagery to orthophotos
- Clip and attach image patches
- Create seamless orthophotomosaics
- Preview orthophotomosaics
- Adjust tones manually
- Compute automatic tone adjustment for images
- Adjust tone with color balance
- Adjust white and black balance

EspaCity

- Extract 3D data using stereoscopic measuring, image-wise measuring or orthophoto measuring
- Utilize various alternatives for stereoscopic viewing
- Compute y-parallax free epipolar images on-line
- Adjust tones automatically
- Superimpose 2D or 3D vector data on stereo images
- Exchange spatial data between EspaCity and other applications using EspaGate linkage
- Import and export spatial objects using shape files
- Select object type from various alternative geometry types (with or without attribute information)
- Use layer techniques to separate vector data sets (active, hidden, 2D, background)
- Use Object Edit to work in 3D
- Use Trail Edit to work in 3D
- Find height level automatically
- Control height level continuously
- Compute digital elevation models (DEM) automatically
- Check and measure point data efficiently with EspaDrive tools
- Compute and edit grid elevation models
- Visualize grid models with several techniques
- Compute smooth contour lines
- Utilize pre-defined feature models for 3D modeling of spatial objects

EspaGate

- Standard set-up enables spatial data transfer between EspaCity and the
  (a) ArcGIS environment
  (b) AutoCAD environment
  (c) MicroStation environment
- Special set-up enables spatial data transfer between EspaCity and the
  (d) Smallworld environment
  (e) Trimble Locus environment
  (f) Topocad environment
- Develop your own EspaGate application using EspaGate API programming interface (C++)

EspaEngine

- Process airborne LIDAR data
- Process photogrammetric point data
- Read and write LAS format files
- Read and write XYZ format files
- Classify georeferenced points automatically
- Classify georeferenced points in stereo (EspaCity connection)
- Compute grid elevation models
- Compute contour lines
- Visualize data in point clouds (free viewing angle)
- Visualize grid elevation models with wireframe or filled area (free viewing angle)
- Visualize grid elevation models with colors (free viewing angle)
- Visualize grid elevation models with hill shading (free viewing angle)
- Visualize grid elevation models with lighting (free viewing angle and customizable light source)
- Visualize grid elevation models by wrapping existing image data over grid (free viewing angle)
- Visualize grid elevation models with contour lines(free viewing angle)
- Check data in stereo (EspaCity connection)
- Edit existing data in stereo (EspaCity connection)
- Collect new data in stereo (EspaCity connection)

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