

ImageStation Automatic Elevations DSM

ImageStation Automatic Elevations DSM (ISAD) from Hexagon is a superset of ImageStation Automatic Elevations (ISAE) that combines the modern dense pixel-level image correlation strategy of Semi-Global Matching (SGM) for producing digital surface models (DSMs) with the classic feature-based matching approach of ISAE for producing digital terrain models (DTMs) in a distributed production environment. The software offers a robust set of features that help increase your overall productivity.

DTMs and DSMs are critical components of modern spatial data processing for photogrammetric, mapping and engineering workflows. Having an accurate and up-to-date elevation data layer is critical for many applications, including orthophoto creation, topographic mapping, engineering design and analysis, transportation planning, flood hazard mapping, terrain analysis for vehicle mobility, viewshed analysis, flight planning and simulation, precision farming, soil analysis, change detection, and many others.

Feature-based matching

The feature-based matching component of ImageStation Automatic Elevations DSM automatically extracts DTM elevation points from aerial frame, Leica ADS and satellite stereo images. The software's hierarchical image data structures and image processing methods provide exceptional automation and accuracy. The software produces higher-quality DTMs by combining digital image matching algorithms, high redundancy, automatic blunder detection and a robust least squares by using finite element interpolation.

The software reduces processing time by defining collection areas and skipping excluded areas. The software is completely multi-threaded; it is a true symmetric multiprocessor (SMP) application, meaning it runs on multiple CPUs in the hosting computer workstation for improved performance. The software also supports distributed processing over a network by using the HTCondor distributed processing system.



Point cloud created using SGM correlation from 5 cm GSD DMC imagery.

Key features

- Source imagery from aerial frame (including UAS/UAV) and Leica ADS line sensors, as well as satellite sensors such as WorldView, GeoEye, SPOT, Pleiades, Cartosat and many more
- Supports both film-based and digital aerial cameras, such as the Leica DMC, RCD30 and ADS
- Supports 1-, 3- and 4-band source images with 8- to 16-bits per band
- Automatically generates high-quality terrain models
- Provides enhanced matching algorithm
- Supports adaptive parameter tuning and variation of grid spacing based on the terrain's relief characteristics
- Uses a surface reconstruction module to capture DTM points in poor texture areas
- Explodes borderlines to avoid edge effects
- Uses existing geomorphic features to improve automatic DTM generation
- Optionally suppresses grid points near breaklines and obscure areas
- Provides option to automatically generate non-overlapping model collection boundaries
- Blockwise matching option reduces redundant coverage and increases processing speed
- Performs epipolar resampling of stereo imagery on-the-fly
- Offers separate class definitions and symbologies for points of different statistical qualities
- Generates DTM points in the north direction
- Checks accuracy and bias of automatically generated points against an ASCII file of control/check point coordinates (Delta Z)
- Provides the raw elevation data (stored in an ASCII file) that is generated before interpolation is used to generate a grid
- Writes elevation data into ImageStation's triangulated irregular network (TIN) surface file format (.dtm)
- Posts the generated elevation data to a MicroStation design file automatically
- Performs batch processing
- Supports distributed processing by using HTCCondor for Hexagon Geospatial
- Delivered with support for four local or distributed processing nodes



Top-down and iso views of point cloud created using SGM correlation from 10 cm GSD DMC imagery.

Semi-Global Matching

The Semi-Global Matching (SGM) component of ImageStation Automatic Elevations DSM automatically extracts DSMs from aerial frame and satellite stereo images. The SGM algorithm computes a disparity map that matches pixels in epipolar space. The algorithm applies the sensor model to compute the forward spatial intersection of imaging rays to transform the image coordinates of the matched pixels to ground coordinates, then writes the intensity- and colour-encoded XYZ points to a point cloud file. The software also provides an option to create a rasterized version of the point cloud with a “true ortho” perspective that eliminates building lean and straightens bridges.

The software reduces processing time with options for automatically generating model collection areas and blockwise matching. The software is multi-threaded for improved performance and also supports distributed processing over a network by using the HTCondor distributed processing system.

Key features

- Source imagery from aerial frame (including UAS/ UAV) and satellite sensors such as WorldView, GeoEye, SPOT, Pleiades, Cartosat and many more
 - Supports both film-based and digital aerial cameras, such as the Leica DMC and RCD30
 - Supports 1-, 3- and 4-band source images with 8- to 16-bits per band
 - Full resolution processing option (every input pixel)
 - Provides option to select an image pyramid level to process
 - Provides option to specify terrain type as sharp, large-parallax detail or smooth, small-parallax detail
 - Provides option to enhance dark areas to provide more detail for matching in dark/shadowy areas
 - Provides option to generate secondary subsampled point clouds for quick viewing at a user-defined pixel spacing or ground sample distance
 - Provides option to generate rasterized versions of the point clouds at a user-defined pixel ground sample distance
- Performs epipolar resampling of stereo imagery on-the-fly
 - Provides option to automatically generate non-overlapping model collection boundaries
 - Blockwise matching option reduces redundant coverage and increases processing speed
 - Provides option to inflate overlap between adjacent collection boundaries to avoid edge effects
 - Native 64-bit application for increased memory capacity and performance
 - Output data formats include:
 - Uncompressed or compressed LAS/LAZ-formatted point cloud files
 - Intensity-, RGB- and RGBN-encoded point cloud files
 - Pan, RGB and RGBN GeoTIFF raster files
 - Output files compatible with GeoMedia, ERDAS IMAGINE and third-party applications
 - Performs batch processing
 - Supports distributed processing using HTCondor for Hexagon Geospatial
 - Delivered with support for eight local or distributed processing nodes





Point cloud created using SGM correlation from 2 cm GSD DMC imagery.

Integrated solutions

ImageStation Automatic Elevations DSM is a member of the ImageStation software suite for photogrammetry production workflows. The feature-based matching workflow integrates with other ImageStation modules such as ImageStation DTM for GeoMedia (ISDG) and ImageStation Stereo for GeoMedia (ISSG) in a GIS environment; or ImageStation DTM Collection (ISDC), ImageStation Feature Collection (ISFC) and ImageStation Stereo Display (ISSD) in the MicroStation CAD environment to create and edit DTM files.

The feature-based matching uses information such as breaklines, points, collection boundaries and obscured collection areas. These geomorphic and boundary features are stored in a triangulated irregular network (TIN) format surface file or MicroStation design file. ISDG together with ISSG, or ISDC together with ISSD, provides interactive stereo collection of the geomorphic and boundary features for input to the feature-based matching. ISDG and ISSG, or ISDC and ISSD, are also used for stereo viewing and editing of DTM points extracted by the feature-based matching in ISAD.

The SGM matching workflow integrates with other Hexagon geospatial applications such as GeoMedia 3D and ERDAS IMAGINE for viewing and editing the point clouds, and ImageStation OrthoPro for mosaicking the rasterised versions of the point clouds.

ImageStation DTMQue can be used to supplement these workflows with elevation file format conversion, coordinate transformations, tiling, merging, basic 3D viewing and QA/QC tools for assessing accuracy.

About Hexagon

Hexagon is a global leader in digital reality solutions, combining sensor, software and autonomous technologies. We are putting data to work to boost efficiency, productivity, quality and safety across industrial, manufacturing, infrastructure, public sector, and mobility applications. Our technologies are shaping production and people-related ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

Hexagon's Safety, Infrastructure & Geospatial division improves the resilience and sustainability of the world's critical services and infrastructure. Our solutions turn complex data about people, places and assets into meaningful information and capabilities for better, faster decision-making in public safety, utilities, defense, transportation and government.

Hexagon (Nasdaq Stockholm: HEXA B) has approximately 21,000 employees in 50 countries and net sales of approximately 3.8bn EUR. Learn more at [hexagon.com](https://www.hexagon.com) and follow us @HexagonAB.

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