

Digital Photogrammetric Workstations

This product overview on Digital Photogrammetric Workstations (DPW) provides an update on that published exactly two years ago, in December 2007.

▷ Today DPWs are software systems that run on off-the-shelf consumer PCs to which may be attached a special mouse, stereo-viewing hardware, and sometimes other devices supporting specialised (mapping) tasks. All systems listed are based on Microsoft operating systems. All manufacturers provide training, varying from one day to one week or longer in duration.

The best choice of a DPW depends on end-user scope and application, the main considerations being functionality and value for money. For example, CartoData's AU4 has been developed for bulk mapping purposes and automatic creation of Digital Elevation Models (DEM), and derived products such as contour maps. The images are supposed to be aerotriangulated in a previous step. Similarly, Summit Evolution from Datem has been developed for 3D feature collection for direct input into GIS systems, particularly AutoCAD, MicroStation or ArcGIS. The system does not include, but can interact with, aerotriangulation software. The type of imagery which can be processed by the system, e.g. aerial, very high-resolution satellite or radar imagery is also an important selection criterion. Other important matters include whether or not integration with airborne Lidar points should be possible, e.g. to automatically create (true) orthoimages; and which method of stereoviewing is used, because operators should feel comfortable with the 'glasses' through which they look all day long.

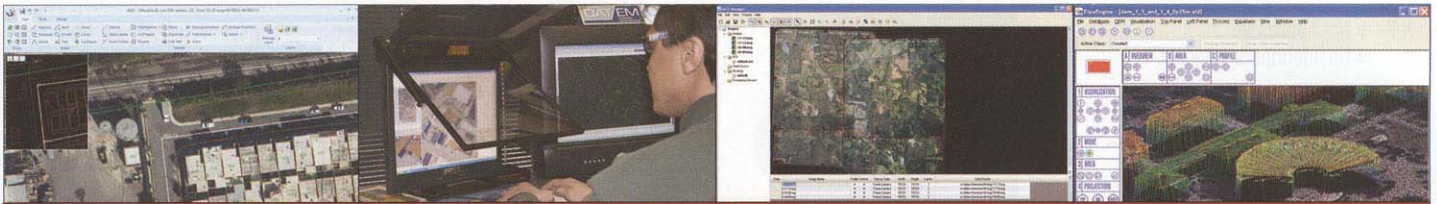
For the first time, Erdas is listed. Established in 1978 as remote-sensing image processing developer, the company was taken over by Leica in 2001, which in turn was acquired by Hexagon in 2005. In April 2008 Leica Geosystems Geospatial Imaging was rebranded Erdas, because it was felt it needed to be dissociated from software solutions and linked instead with opto-mechanical photogrammetric systems. Basically, the DPW listed is the Leica Photogrammetry Suite (LPS).

Most manufactures deliver scalable solutions by offering separate modules, each focused on a different photogrammetric task, varying from aero-triangulation to automatic DEM creation, orthophoto production and mosaicking, (stereoscopic) 3D mapping to processing of georeferenced airborne Lidar data. The DPW can thus be personalised according to needs.

N/A = Not Applicable
 = No information received

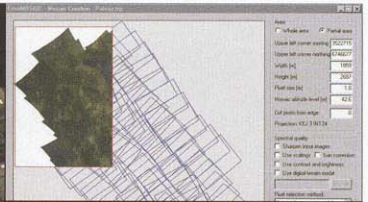
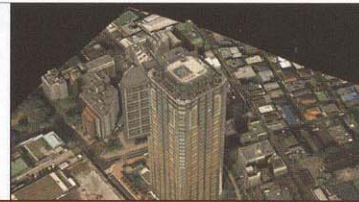


Supplier	Cardinal Systems, LLC
Brand/Model	Vr Mapping
Date of Introduction	2000
Required Computer System	
- System includes Hardware (Y/N)	Optional
- CPU (min./pref.)	Core2Duo, QuadCore
- RAM memory [Mb] (min./pref.)	4GB / 4GB
- Mass storage capacity (min./pref.)	320GB / 1TB
- Graphic Card [Mb] (min./pref.)	128Mb / 512Mb
- Supported special hardware[1]	Stereo display hardware
- User definable operations and extensions[2]	Python programming, macros, function keys
Viewing System	
- Display memory [Mb] (min./pref.)	128MB / 512Mb
- Size/resolution of screens [inches/pixels]	23inch / 1680x1050 LCD
- Method of stereo image separation	Quad-buffered active/passive stereo
Images and data	
- Supported Image Types[3]	Panchromatic; colour; frame; ADS40; scanned aerial
- Input image formats[4]	TIFF, JPEG, ECW, MrSid, ADS40
- Export data formats	DXF, Microstation, ArcView, DSFL, CAICE
- Compression techniques (Y (Type)/N)	Y (JPEG)
- Backup facilities included (Y/N)	Y
Image processing [a]	
- Spatial Convolution (Y (specify)[5]/N)	N
- Resampling (Y (specify)[6]/N)	Y ([b],[c])
- Radiometric corrections[7]	N
Orientation and triangulation [f]	
- Automatic aerotriangulation (Y/N)	N (semi-automatic)
- Automated blunder detection (Y/N)	Y
- Self-calibration (Y/N)	Y
DEMs/Orthoimages [g]	
- Automatic Matching (Y (specify)[8]/N)	Y (area based)
- Automatic breakline extraction (Y/N)	N
- Interactive mosaicking of orthoimages (Y/N)	Y
- True Orthoimage Generation (Y/N)	N
Feature Extraction and Mapping [h]	
- Integration with other datasets (Y (specify)[9]/N)	Y (vector data, TIN, DEM, scanned maps, 3D point-clouds, cell libraries)
- Semi-automatic corner point extraction (Y/N)	N
- Semi-automatic line feature extraction (Y (specify)[10]/N)	N
- Semi-automatic building extraction (Y/N)	N
Extra information	
- Major applications (max. 5)	<input type="checkbox"/>
- Major advantages of this system, compared to other systems (max. 20 words)	Pragmatic; 190 targeted mapping applications; developed by mapping professionals

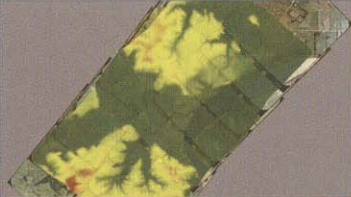




CartoData	DATEM	ERDAS	ESPA Systems Ltd
AU4	Summit Evolution™	LPS	ESPA Systems software
12/15/2008	April, 2001	1999 as OrthoBase	1996
N	Optional (Dell Precision Workstation T7400)	Hardware available separately	N
Dual core 2.3GHz processor	Dual 2.5Ghz Quad Core or better	Intel Pentium 4 or higher/dual processors	PC-workstation
2Gb	2GB+	2GB / 4GB	1024Mb / 4096 Mb
20Mb / 200Mb	200GB+	10GB / 1TB	As required
Video Card 256Mb stereo ready	NVIDIA Quadro FX4600	NVIDIA Quadro FX 3450/3500/4000/4500 (pref.)/4600 (pref); 3Dlabs Wildcat 4 7110/III 6110/ 5110	OpenGL
All pointing devices; handwheels	3D cursors; tactile interface devices; handwheels/ footdisk; pedals	3D cursors and mouse; hand wheels; photogrammetric scanners; digitisers; stereo glasses	Stereoscopic display
Y	CAPTURE™ API; scripting by underlying CAD/GIS is supported; Map/Editor™; Landscape™	EML, batch process with scripting	EspaGate API library
128Mb / 256Mb	(Recommended: Planar StereoMirror) 768Mb	256MB (min.)	256MB / 1024MB
1280X1024 pixels	17-, 22-, 26-inch	80 (min.)	24inch / 1920x1200
Quad-buffered stereo	Dual displays + mirrored beamsplitter; passive polarised glasses	Anaglyph; polarised glasses	Several alternatives
Panchromatic; colour	Panchromatic; true & false colour; multispectral (unlimited bands); Lidar; radar; any image in epipolar form. Methods available to orient satellite, digital camera, oblique imagery to epipolar form.	Panchromatic; multispectral (bands unlimited), radar; push/whiskbroom; radar satellite, aerial, and terrestrial sensors	Digital frame cameras; scanned aerial photographs
TIFF, JPG, DXF, DWG	Virtually all	Virtually all	TIFF, BigTIFF, JPEG, Shape, LAS
DXF and DWG	.tif, .shp, .dgn, .dwg; underlying CAD/GIS formats.	Virtually all	TIFF, BigTIFF, JPEG, Shape, LAS
Y (Pyramids)	Y (JPEG, MrSid, ECW)	Y (JPEG, LZW, Packbits, RLE, JPEG2000, MrSID, ECW)	Y (JPEG, GZIP)
Y	N	N	N
N	Y (sharpening, smoothing)	Y (smoothing, sharpening, user definable)	Y (sharpening)
N	Y ([b], [c])	Y ([b], [c])	Y ([b])
N	Y (earth curvature; atmospheric refraction)	Y	Y (Atmospheric, sensor specific)
N	Y (with Inpho Match-AT)	Y	N
N	Y (with Inpho Match-AT)	Y	N
N	Y	Y	Y
Y (cross correlation)	N	Y (area-based, least-squares, cross-correlation, hierarchical)	Y (cross correlation)
Y	N	N	N
N	Y	Y	Y
N	Y	N	N
Y (scanned maps, 3D point-clouds, vector data)	Y (with data of underlying CAD/GIS)	Y (Shapefile, DGN, TIN, DEM, DTM, Geodatabase, LAS, all LPS/IMAGINE supported formats)	Y (vector data, DEM, 3D point clouds)
N	Y	N	N
Y (road centerline)	N	Y (roads, edges, snakes)	N
N	N	N	Y
Large mapping projects	Civil engineering; topographic analysis; natural resource inventory; urban planning; aviation	Triangulation and ortho-mosaic production; mapping (broad area, engineering); transportation planning; close-range.	Mapping; automatic terrain modelling; processing of 3D point-clouds; orthophoto production and mosaicking
Price; project management; rigorous QA/QC	Direct and complete interface to the underlying CAD/ GIS; easy and logical to use; top technical support and documentation	Ease of use; breadth of functionality; scalability; global support; competitive pricing	Scalable photogrammetric package that ties together stereoscopic mapping, point-cloud data processing and spatial data maintenance in GIS

N/A = Not Applicable
 = No information received



Supplier	Intergraph	KLT Associates	MosaicMill
Brand/Model	ImageStation	KLT ATLAS	EnsoMOSAIC, EnsoMOSAIC UAV, EnsoMOSAIC 3D
Date of Introduction	1999	1994	1995
Required Computer System			
- System includes Hardware (Y/N)	Optional	Optional	N
- CPU (min./pref.)	Dual quad-core 1GHz / 3GHz	2.8GHz 8MB L3 Cache	1GHz/3GHz
- RAM memory [Mb] (min./pref.)	1GB / 4GB	2Gb+	1Gb / 4Gb
- Mass storage capacity (min./pref.)	250GB / 500GB	750GB	5Gb / 100Gb
- Graphic Card [Mb] (min./pref.)	128MB / 768MB	Nvidia FX Quadro series 4500 (pref. 512)	4Mb / 16Mb, 256Mb / 512Mb (3D)
- Supported special hardware[1]	<input type="checkbox"/>	Digitisers; touch screens; keypads	Stereoscopic display
- User definable operations and extensions[2]	<input type="checkbox"/>	Fully integrated macro language	ESPAGate API library
Viewing System			
- Display memory [Mb] (min./pref.)	128MB / 768MB	256Mb (min.)	256Mb / 512Mb (3D)
- Size/resolution of screens [inches/pixels]	1280x1024 pixels	Any 19 to 24inch, flat panel	24inch / 1920 x 1200
- Method of stereo image separation	Active or passive polarised glasses; stereomirror, LCD monitor	Planar (hardware); frame sequential; redgreen & redblue anaglyph; split screen	All relevant methods
Images and data			
- Supported Image Types[3]	All types	LiDAR stereo; panchromatic; colour; multi/hyper spectral; radar; scanned aerial photographs; ground-based stations; pushbroom	Panchromatic; multi/hyperspectral digital frame cameras; scanned aerial photos
- Input image formats [4]	Virtually all	GIF, TIFF, JPEG, Vector, sensor specific (e.g. SPOT, Ikonos)	TIFF, JPG, ERS, BIL, RAW
- Export data formats	Virtually all	GIF, TIFF, JPEG, Vector	TIF, JPG, ERS, KML, Shape, LAS
- Compression techniques (Y (Type)/N)	Y (JPEG, JPEG2000, RLE, Adaptive RLE, LZ77)	Y	Y (JPEG, GZIP)
- Backup facilities included (Y/N)	N	Y	N
Image processing [a]			
- Spatial Convolution (Y(specify)[5]/N)	Y (5x5 convolution (MTFC))	Y (smoothing, sharpening, user definable)	Y (smoothing)
- Resampling (Y (specify)[6]/N)	Y ([b], [c], exponential and epipolar resampling on-the-fly)	Y ([b], [c])	Y ([b])
- Radiometric corrections[7]	Y, all	Y (atmospheric, sun angle, sensor specific models)	Y (sun angle, sensor specific)
Orientation and triangulation [f]			
- Automatic aerotriangulation (Y/N)	Y	Y	Y
- Automated blunder detection (Y/N)	Y	Y	Y
- Self-calibration (Y/N)	Y	Y	N
DEMs/Orthoimages [g]			
- Automatic Matching (Y(specify)[8]/N)	Y (feature-based and least-squares based)	Y (feature-based, area-based, hierarchical)	Y (feature-based, cross-correlation, hierarchical)
- Automatic breakline extraction (Y/N)	N	Y	N
- Interactive mosaicking of orthoimages (Y/N)	Y	Y	Y (automatic)
- True Orthoimage Generation (Y/N)	Y	Y	Y
Feature Extraction and Mapping [h]			
- Integration with other datasets (Y(specify)[9]/N)	Y (many including those listed in footnote [9])	Y (vector data, TINs, DEMs, quadtrees, scanned maps)	Y (vector data, DEM, LiDAR)
- Semi-automatic corner point extraction (Y/N)	N	Y	N
- Semi-automatic line feature extraction (Y(specify) [10]/N)	N	N	N
- Semi-automatic building extraction (Y/N)	N	N	Y
Extra information			
- Major applications (max. 5)	Government; military (defence); commercial photogrammetry; mapping/GIS	<input type="checkbox"/>	UAV surveys; mapping (corridor, cadastral, natural resource); DEM processing
- Major advantages of this system, compared to other systems (max. 20 words)	End-to-end workflow from image acquisition, through feature and DTM collection and editing, to orthophoto production and QC	Full integration of applications and data formats into a user-friendly environment, addressing all photogrammetric, cartographic, and orthometric requirements	All processing steps in one integrated package, tailored for medium and small-format imagery, UAV survey compatible

		
<p> Racurs PHOTOMOD 1994 N Intel Core 2 Quad @ 3GHz or similar 2GB for Win32; 4GB for Win64 1000GB Based on NVIDIA Quadro FX 570 Stereomonitors; stereoglasses; special 3D-manipulators <input type="checkbox"/> </p>	<p> SmartTech uSMART Softcopy System 2000 Optional 1300 / 4200 1GB / 4GB Project dependent Stereo option dependent Joysticks; 3D mouse; hand/foot wheels; Z Screen; Planar, DTI, etc Scripts, macros, C, C++, etc <input type="checkbox"/> </p>	<p> Trimble GeoSpatial INPHO System 2000 Y 2Ghz / 3GHz 1GB / 4 or 8Gb Project dependent 512MB / 512MB Not needed Integration with any CAD or GIS <input type="checkbox"/> </p>
> 1024 x 768; colour depth: 24 or 32 bit/pixel	17, 19, 21inch, etc / 1024 x 768 upwards	20inch / 1600x1200; 22inch / 1680x1050; 24inch / 1920x1200
Anaglyph; interlaced; page-flipping	Anaglyph; split screen; page flipped stereo (passive/active); auto-stereo, line/column interleaved	Passive polarised glasses; shutter glasses
<input type="checkbox"/>	Panchromatic; colour, multi/hyperspectral (256 bands); radar; scanned aerial photographs; ground-based stations; pushbroom	Imagery from any digital frame or line camera; scanned images; panchromatic; hyperspectral; radar
TIFF, JPEG, BMP, SPOT 1-5, Terra/ASTER, IRS-1C,1D/PAN, IRS P5, IRS P6, IKONOS, QuickBird, EROS, Landsat-7/ETM+, OrbView-3, FORMOSAT-2, GeoEye-1	<input type="checkbox"/>	TIFF, TIFF/JPEG, JPEG 2000, GeoTIFF, ECW, MrSID, BIP, BIL, BSP, ADS40, IKONOS, QuickBird, OrbView, SPOT, Landsat, IRS
Virtually all	DGN, DXF, DWG, ASCII, LAS and many others	[d]
Y (JPEG)	Y (Deflate, PackBits, CCITT3, CCITT4, RLE, JPEG, ECW, JPEG 2000 etc)	Y (TIFF/JPEG, ECW)
Y	Y	On request
Y (smoothing, sharpening, max. kernel size: 21x21)	Y (smoothing, sharpening)	Y (smoothing, sharpening and user definable)
Y ([b], [c])	Y ([b], [c])	Y ([b], [c], spline)
Y	Y	Y (atmospheric, sensor specific)
Y	Y	Y
Y	Y	Y
N	N	Y
Y (area-based, hierarchical)	Y (area based with least squares)	Y (area-based, feature-based)
N	N	N
Y	Y	Y (automatic and interactive)
Y	Y	Y
Y (TINs, point-clouds)	Y (DGN, DXF, DWG, Native mass data handling, LAS, 3D point-clouds etc.)	Y (DEM, vector data)
N	N	N
N	N	N
N	N	Y
Mapping (topographic, cadastral, large-scale, disaster); orthophotomap production; measurement of relief and buildings; environmental monitoring	[e]	Aerotriangulation; DTM/DSM generation; orthophoto production; feature extraction; DTM management
Price; flexible modular configuration- buy only what you need; full line of output products, wide range of supported sensors	Price; fully configurable; mass data module allowing fast creation, manipulation, display of billions of elements (points, lines, topology etc)	Highly productive by unsurpassed degree of automation; developed and supported by photogrammetric experts; numerous users

Footnotes

- [1] Photogrammetric scanners, digitisers, etc.
- [2] Scripts, macros, programming facilities, graphical programming, etc.
- [3] Panchromatic, colour, multispectral, hyperspectral (# of bands), radar, scanned aerial photographs, ground-based stations, push-broom scanners
- [4] GIF, TIFF, JPEG, ..., Vector (coverages, CAD), sensor specific (e.g. SPOT, Ikonos), etc.
- [5] Smoothing, sharpening, user definable (max. kernel size)
- [6] Nearest neighbour, bilinear, cubic
- [7] E.g. atmospheric, sun angle, sensor specific models
- [8] Feature-based, area-based (least squares, cross correlation), hierarchical, etc.
- [9] E.g. vector data, TINs, DEMs, quadtrees, scanned maps, 3D point clouds
- [10] Objects: e.g. roads, canals, Method: snakes, least squares, etc.
- [a] All DPW systems listed support manual and automatic contrast manipulation facilities and radiometric adjustment for mosaicking, except CartoData's AU4.
- [b] nearest neighbour and bilinear.
- [c] cubic convolution.
- [d] TIFF, TIFF/JPEG, ECW, GEOTIFF, DWG, DGN, DXF, DXF-TIN, ArcGIS (SHP, SHP-TIN, BIL), INPHO project, Summit Evolution, Image Station, SocetSet, LPS, AvioSoft, PATB, Bingo, Bluh, PHOREX, ABC-PC, AP32, SCOP DTM, LAS, ASCII XYZ, VRML, VRML-TIN
- [e] fully integrated Lidar in stereo photogrammetry; automatic massive orthophoto production; fast image and point-cloud processing including close range; powerful mapping capabilities
- [f] All DPW systems listed support automatic interior orientation and (semi)automatic relative orientation, except CartoData's AU4.
- [g] DEM generation: all DPW systems listed provide DEM checking and editing tools, and tools for automatic contour generation.
- [h] All DPW systems listed include mapping facilities except MosaicMill's EnsoMosaic.