

Georeferenced Data Products

This is the first survey ever presented in this magazine on the topic of geo-referenced data products. Eight companies responded to our questionnaire, seven from Europe and one from the US.

What do we mean by geo-referenced data products? Firstly, these products should be deliverable off-the-shelf to costumers all around the world within a few days, either free of charge or commercially priced. The best way to explain our notion of these products is by listing examples:

- Digital Elevation Models (DEMs) derived from airborne and spaceborne radar data, satellite imagery, airborne Lidar or aerial imagery
- (true) ortho-imagery derived from aerial imagery
- terrestrial imagery and Lidar point-clouds taken at street level
- 3D city models.

The products should cover substantial parts of the globe, starting from (joint) parts of continents up to the planet as a whole. They may cover either urban or rural areas, or both. Included also are data products covering specific geographical entities, such as coastal zones and mountains, on a global scale. Excluded are (1) image products such as ortho-imagery, derived from satellite imagery; these are already listed in our regular Product Survey on High-resolution Satellite Imagery, and (2) photo and map products from National Mapping Agencies (NMA).

Blom, based in Norway, responded with six products. We selected three for listing here. The other three are (1) ortho images of Denmark, Netherlands and Italy created from aerial images recorded using various digital cameras, (2) Pictometry ortho and oblique images of over 2,000 municipalities, and (3) DEM Denmark, created from airborne Lidar data.

In addition to terrestrial panoramic imagery, as listed here, the Netherlands based Cycomedia also delivers digital orthomosaicks of the entire territory of the Netherlands at 10cm resolution and delivery unit 0.5km². This product has been excluded from the present list.

Infoterra, based in Germany, will this year launch a twin satellite, TanDEM-X, to orbit in close formation with TerraSar-X. The resulting DEMs, to become available in 2011, will have similar characteristics as the here listed TerraSAR-X Stereo DEM, but global coverage will be seamless and homogeneous, accuracy improved, and the delivery unit will be km². Remarkably, Intermap Technologies is able to derive from DEM source data of 5m x,y precision, DEM products with x,y precision of 2m. Tele Atlas, based in the Netherlands, is the only company in this survey delivering 3D city models of major cities. All products listed are in digital format.

Company	Aerodata International Surveys
Product Name	Ortho:10 Netherlands / Belgium / Europe
Date of Introduction	1-1-2010 / 3-1-2009 / 1-1-2010
Source data	
- original main data source	digital aerial photographs
- resolution [m] / scale	10cm / 40cm countryside / 15cm main cities / 2.5-30cm
- x,y precision [cm]	10cm
- z precision [m]	30cm
- data structure [1]	raster
- acquisition date / period	2009
Product Features	
- product type	ortho imagery [a]
- resolution [m] / scale	10cm / 40cm rural; 15cm urban / 2.5-30cm
- x,y precision	< 50cm / < 1m / < 1m
- z precision	n/a
- data structure [1]	raster
- update cycle	yearly / regularly / occasionally
- B,G,R, IR, bit depth of image [2]	RGB (8 bits)
Coverage	
- area	Netherlands / Belgium / European cities
- urban / rural	both / both / urban
- delivery unit [3]	
- number of views per terrain point [4]	minimal 2
Deliverables	
- deliverable medium [5]	HD, USB stick, internet (WMS)
- data formats	tiff, ECW
Required computer system	
- type of hardware	PC, laptop
- RAM memory [GB] (min./pref.)	1GB / 4GB
- mass storage capacity (min./pref.)	320GB / 1TB
- graphic card (Y [Mb] (min./pref.), N)	Y (128MB / 512MB)
- special hardware (Y (specify), N)	N
- special software (Y (specify) /N) [6]	Y (GIS, CAD)
Application	
- training facilities (Y (list duration) /N)	Y (1 day)
- main users (max. 5)	municipalities, NMAs, water boards, engineering companies
- main applications (max. 5)	digital mapping, urban planning, city modelling, change detection
- distinguishable features (max. 20 words) [7]	high precision and resolution; price / quality ratio; over the Netherlands and Belgium seamless countryside coverage.

Company	Airborne Hydrography AB	Blom	Blom	Blom
Product Name	HawkEye II	Real Images	Blom3D	BlomURBEX
Date of Introduction	01-08-2005	2005	2008	2008
Source data				
- original main data source	Lidar	oblique aerial imagery	oblique + nadir aerial imagery + DEM	oblique aerial imagery + ortho + DEM
- resolution [m] / scale	2m	10 - 15cm	10 - 15cm	10 - 15cm
- x,y precision [cm]	1.7m	n/a	2 - 5m	1 - 5m
- z precision [m]	< 20cm	n/a	1 - 10m	1 - 10m
- data structure [1]	irregular points	raster	raster	raster, vector
- acquisition date / period	any season	2005-2010	2006 - 2009	2005 - 2009
Product Features				
- product type	DEM	Oblique Image Library	3D city models	Geoserver
- resolution [m] / scale	1m	10 - 15cm	n/a	10 - 15cm
- x,y precision	1m	1-5m	<5m	1 - 5m
- z precision	< 25cm	1-10m	<10m	1 - 10m
- data structure [1]	raster	raster	3D vector [c]	raster
- update cycle	n/a	2 - 3 years	2 years	2 years
- B,G,R, IR, bit depth of Image [2]	8 bits	RGB	RGB (24 bits)	RGB (24bits)
Coverage				
- area	worldwide	>100,000km ² in Europe, cities with population > 50,000,	> 200 main cities worldwide	
- urban / rural	seafloor morphology	urban	urban	both
- delivery unit [3]	km ²	km ²	km ²	km ²
- number of views per terrain point [4]	1	5 (nadir, east, west, north and south)	1	minimal 5
Deliverables				
- deliverable medium [5]	harddisk	harddisk, ftp	internet, DVD, CD	internet
- data formats	LAS,TXT, BIN, ASCII, GeoTIFF, JPG, PNG, BMP	proprietary format	proprietary format	JPEG, PNG
Required Computer system				
- type of hardware	PC, laptop	PC, laptop	[d]	[d]
- RAM memory [GB] (min./pref.)	1GB / 4GB	128MB / 256MB+	1GB / 2GB	
- mass storage capacity (min./pref.)	320GB / 1TB	150MB		
- graphic card (Y [Mb] (min./pref.), N)	Y (128MB / 512MB)	Y (4MB)	Y (512 MB / 2GB)	
- special hardware (Y (specify), N)	Y [h]	N	N	N
- special Software (Y (specify) /N) [6]	Y (in-house developed)	Y (EFS) [b]	Y (OpenGL 1.1 for online viewing)	Y (internet Browser/ BlomURBEX SDKs)
Application				
- training facilities (Y (list duration) /N)	Y (1 week)		N	N
- main users (max. 5)	environmentalists, urban planners, NMAs, water boards, disaster managers	local authorities, directory services, police, fire and rescue services, architects	municipalities, tourism agencies, internet and mass users	municipalities, tourism agencies, internet and navigation users
- main applications (max. 5)	shallow water surveying, coastal management	planning, emergency response, event planning	directory services, security	navigation, directory services, security
- distinguishable features (max. 20 words) [7]	performance, high precision	five views on ground points, DEM included enabling measuring, image export, vector intergration	three subproducts: browser plugin (IE8, Firefox, Chrome,...), Lowlevel SDK, ActiveX., optionally: including advertising campaigns.	measurable oblique and ortho images, fast response

[1] E.g. irregular points, vector, raster.
 [2] If product is image list the spectral bands B(lue), G(reen), R(ed) Infra(Red) and bit depth.
 [3] List smallest unit in which you sell the data e.g. km²; municipality, country, state, country, continent.
 [4] Especially photo products usually provide more than one view on the same terrain point. List the number of views.

[5] E.g. CD, USB stick, internet.
 [6] E.g. ArcView, Geomedia or special in-house developed software.
 [7] List the features which distinguishes this product from simular products.

CycloMedia	Euromap GmbH	Infoterra GmbH	Intermap Technologies	Tele Atlas
Cycloramas	Euro-Maps 3D	TerraSAR-X Stereo DEM	NEXTMap Europe, NEXTMap USA	Advanced City Models (3D)
1991	2010	2009	2008	May 2009
ground-based panoramic imagery	optical satellite imagery [e]	radar satellite images (stereo pairs)	DEMs	digital aerial photographs
0,075 degrees	2.5m / 1:12,500	3m	n/a	n/a
10cm		<1m	5m	n/a
10cm		n/a	1m	n/a
raster	raster	raster	raster	raster
1 year	2006 -2010	continuous (2007-2013)	Europe 2008; USA 2009	May 2008
mobile mapping data	DEM	DEM	DEM	3D City Models
0,075 degrees	5m	10m (posting)	n/a	n/a
10cm	10m	5 - 10m [f]	2m	n/a
10cm	10m	5 - 10m [f]	1m	n/a
raster	raster	raster	raster	3D vector [g]
1 year		on demand	n/a	multi year
RGB (8 bits)	16 bits	32 bits	n/a	n/a
Netherlands, North Belgium, partly Europe and Middle east	Europe, other areas on request	regional (global availability)	Western Europe, US	global
both	both + mountains & coasts	both	both	urban
city, km ² , country	0.5° x 0.5° tiles or 27km x 27km	> 500km ²	2km ²	city centres (on average 40km ²)
3	1	2 - 4 [f]	1	1
internet, hard disk	CD, DVD, FTP	FTP server, DVD	CD/DVD, internet	DVD, hard disk
CMI, JPG	GeoTIFF	GeoTIFF	ASCIIXYZ, BIL, ESRI ASCII, GeoTiff	Shapefile, VRML
PC, laptop	PC, laptop	workStation, PC, laptop	PC, laptop	n/a
1GB / 4GB	2GB / 4GB	1GB / 4GB	1GB / 4GB	n/a
n/a	320GB / 1TB	> 100GB	320GB / 1TB	n/a
Y (128MB / 512MB)	Y	Y (128MB / 512MB)	Y (128MB / 512MB)	n/a
N	Y	N	Y [h]	n/a
N	Y (GIS with 3D application)	Y (off-the-shelf)	N	n/a
Y (0,5 day)		Y (> 1 day)	Y (1 day)	Y
local and central governments, national road administrations, utility and insurance companies, water boards, cadastre	urban planners, NMAs, defence, creators of 3D city models.	geospatial intelligence, NMAs, environment agencies; engineering; disaster management	property insurers, network planners, NMAs, ADAS/PND managers, urban planners	urban planners, navigation users, internet mapping and mobile users
asset management, project preparation, communication, mapping and inventories	basis for 3D realistic terrain visualisation, ortho-rectification of satellite images.	planning, topographic mapping, aviation, disaster management, base for orthorectification	automotive, telecommunications, risk management, consumer electronics, other engineering	enhanced map display in 3D; gaming
price / quality, ease of use, high ROI and level of detail, nationwide coverage	accurate, up-to-date, realistic, compatible	high resolution & precision, weather independent data acquisition, global availability (regional level), cost-efficient, established distribution	high resolution and accuracy, availability, countrywide, uniform,	significant coverage, expanding by 200 cities per year, multiple levels of detail enables attractive 3D display

[a] In addition to the ortho-images also stereo images are provided as standard for the Netherlands (x,y,z precision 10cm), while also available for other European countries.
 [b] EFS: Electronic Field Study from Pictometry Inc is included.
 [c] 3D wireframes and 3D models, levels of detail: extruded blocks, buildings with roofs, buildings textured from oblique imagery.

[d] PC, portable navigation devices, smart phones.
 [e] IRS-P5 Cartosat-1 in flight stereo pairs.
 [f] Depending on terrain characteristics.
 [g] 3D textured building models.
 [h] Optional stereo display hardware drastically reduces the requirement for site visits.