





Innovation in mapping and photogrammetry at the Survey of Israel

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16, October, 2017

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• Why HD mapping?

Government requirements

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- Land cover mapping
- Data sharing and presentation
- Final thoughts

Geo-spatial data drives modern technologies



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Geo-spatial data in the future



Government/Society new requirements

- Technology is changing in exponential rate
- We need to quickly adapt and incorporate these new innovations



From: Thomas Friedman, 2016 Thank You for Being Late

- High definition mapping is essential component for the following applications:
 - Modern infrastructure
 - Efficient land use
 - Autonomous transportation
 - Smart city (nation)
- High definition mapping is:



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- The Survey Regulations is the principal document that standardizes the professional activities in four key areas- geodetic control, mapping, cadastre and Geographic information systems.
- New regulations published last year (2016)
- Licensed Surveyors and mapping professionals in Israel are required to work according to those regulations.
- It includes accuracy and resolution specification for mapping.
 Procedures to certify mapping equipment





• These are the accuracy requirements mapping products according to the Survey Regulations of 2016:

Accuracy level	RMSE in Easting or	CEP 95 (m)	Largest scale	
	Northing (m)			
1	0.01	0.03	1:50	
2	0.03	0.08	1:100	
3	0.06	0.15	1:250	
4	0.13	0.32	1:500	
5	0.25	0.62	1:1,000	
6	0.30	0.74	1:1,250	
7	0.63	1.55	1:2,500	
8	1.25	3.06	1:5,000	
9	2.50	6.12	1:10,000	
10	6.25	15.3	1:25,000	
11	12.50	30.6	1: 50,000	

• These are the accuracy requirements mapping products according to the Survey Regulations of 2016:

Accuracy	Spot height		Elevatio	Contour line	
level			define	d point	interval (m)
	RMSE (m)	LEP95 (m)	RMSE (m)	LEP95 (m)	
1	0.01	0.02	0.02	0.04	0.05
2	0.02	0.04	0.03	0.06	0.10
3	0.05	0.10	0.08	0.15	0.25
4	0.10	0.20	0.15	0.30	0.50
5	0.20	0.40	0.30	0.60	1.00
6	0.25	0.50	0.38	0.75	1.25
7	0.50	1.00	0.75	1.50	2.50
8	1.00	2.00	1.50	3.00	5.00
9	2.00	4.00	3.00	6.00	10.00
10	5.00	10.00	7.50	15.00	25.00
11	10.00	20.00	15.00	30.00	50.00



• The regulations set the maximal pixel size for the creation of each mapping product:

Accuracy level	3	4	5	6	7	8	9
Maximal pixel size in cm	2.5	5.0	7.5	10.0	12.5	25.0	50.0

 Moreover, the regulations determine that every permanent object visible on the image, which covers an area greater than 36 times the ground resolution should be mapped as a matter of routine.



- 1. Tests for Interpretability (similar to NIIRS) to see that completeness requirement are met
- 2. Calculation of Relative Edge Response (RER) and Signal-to-Noise (SNR) to rate Image Quality (GIQE).



Image by a Z/I DMC II 140 camera Courtesy of Hetz Hazafon

Certification Process:

 A five steps process that involves the mapping firm, a certification body and the Survey of Israel

Performed by



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National mapping standard

Standards for data format and layers



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M4801	קו ביוב תת קרקעי	קו ביוב
M4802	קו סניקה	קו סניקה
M4804	שוחת ביוב	 שוחת ביוב
M4805	משאבה	מש משאבה
M4807	שסתום אויר/ נשם	о נשם
M4819	כיוון זרימה	>
M4820	אגן חמצן	אגן המצו
M4850	אביזר ביוב כללי	
M4851	נתוני גובה במהלך קו ביוב	

TAK

Standards for the content cartography



National database development



Who collect/manage the data?

- Data is being created in four sectors:
- Government includes mapping agency



• Open a project and upload a map (DXF file in proper format)



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• Open a project and upload a map (DXF file in proper format)

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• Check data topology and format and present the map



• Obtain error report and metdata

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- Goals and Objective
- Use Automatic change detection methodology to update national Geodatabase
 - Reduce human interference and involvement.
 - Reduce production costs.
- Minimizing development costs using Open Source software.
- High productivity rate: 1600 km² of mapping per day



Methodology



Case Study: Bedouin settle of HURA

Image Classification Segmentation & Height Correction

Building Change Detection





Goals and Objective

- Develop automated updating methodology for the Land Cover layer
 - Based on SOI's National Topographic Data Base Attributes.
 - Meeting requirements of government geo-spatial clients and users necessities.
- Enabling external data integration
 - From the agriculture ministry, forest agency, road layer...
- Data production will have **85% accuracy level**.





Land Cover Automatic Updating Prototype



Methodology



Land Cover Automatic Updating Prototype

Case Study: Gush-Dan Area, Center of Israel

- Segmentation
 - Semi automated bordering
- SVM
 Classification
 - Ensuring updated data
- Data sources fusion:
 - Height Correction
 - External data GIS layers



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Summary

- The proposed methodology depicts promising results with an overall accuracy higher than 83%.
- Accurate and dense elevation models (DSM, DTM), as well as spectral data excessiveness will increase overall accuracy level of the process.
- Presented process allows large scale NTDB updating in short periods of times.



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What is a smart nation?

- Seamless flow of information in the government and to citizens
 - Efficient processes based on intelligent analysis of data



Data presentation in Israel?

- On-line information from sensors; e.g.:
 - Weather Radar (is it going to rain in 5 min?) 2.8 million users
 - Air quality sensors
- Basic GIS functionality for the public and for departments within the city (create layers, query, present and share)
- More than 240 governmental layers
- More than 5000 layers created by users (i.e. cities)



- To adapt to technological advancement, we need
 Good data, advanced applications and sharing culture
- These fundamental things require small investment but have a huge impact on the service for the citizens
- Mapping agencies should take the lead in these activities





Thanks for listening

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