

Warsaw University
of Technology

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The new methods of visualisation of the cadastral data in Poland

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***The results of researches concerning the study of new ways of
geovisualisation of the cadastral data in Poland***
(Dean's research grant at Warsaw University of Technology)

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The new methods of visualisation of the cadastral data in Poland

- *modification of methods of data geo-visualisation concerning boundary lines and points,*
- *defining new cadastral maps combining vector and raster data (aerial photographs) and the terrain relief model,*
- *geo-visualisation of data concerning premises,*
- *geo-visualisation of data concerning untypical objects in the cadastre – e.g. subway tunnels*

Modification of methods of data geo-visualisation concerning boundary lines and points

The boundary point is defined in Poland by the following attributes:

- **STB** – the stabilisation code,
- **ZRD** – source of data on the location of the boundary points,
- **BPP** – the mean error of the boundary point in relation to the 1st class control points network.

The Polish cadastral maps present the status of the boundary point, but to the limited extent.

Diversification in the cartographic space concerns the attribute of the point stabilisation (stable/unstable) only; however diversification related to the attribute which characterises the accuracy of the location of a boundary point does not occur.

Modification of methods of data geo-visualisation concerning boundary lines and points



All boundary's points are presented in the same way...

Why ?

All of them are not marked on the ground

But ...

attribute which characterises the accuracy of the location of a boundary point BPP is different for points

Source: A CADASTRAL MAP IN POLAND - THE PROPOSAL BASED ON ANALYSIS OF CADASTRAL MAPS IN SELECTED COUNTRIES - Marcin Karabin, Robert Łuczyński, Magdalena Karabin-Zych (17 International Multidisciplinary Scientific GeoConference SGEM 2017, 27 June - 6 July, 2017 Albena Bulgaria)

Modification of methods of data geo-visualisation concerning boundary lines and points



Boundaries of parcel
193/1 (subdivision plan)

Boundaries of parcel
193/2 (demarcation
documents)

Boundaries of parcels
198/1, 198/2, 198/3
(subdivision plan)

Boundaries of parcel
196 (delimitation
documents)

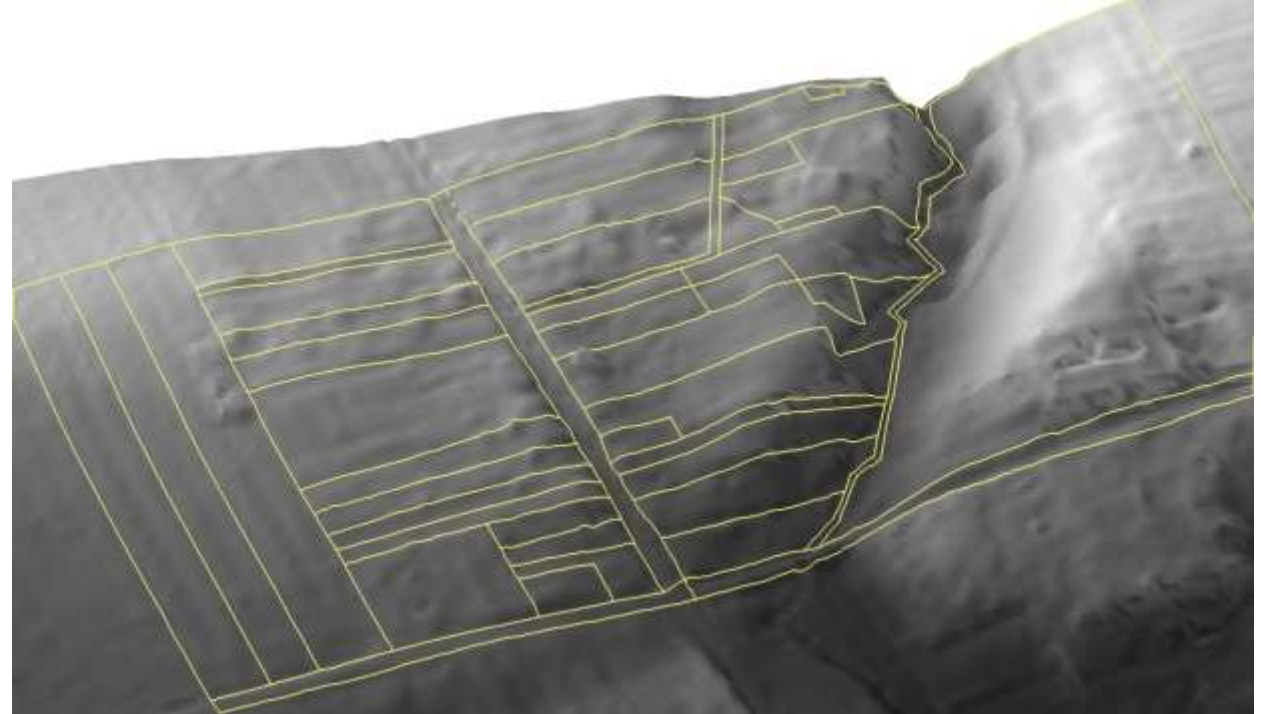
Rest of the boundaries
showing on cadastral
map – digitalisation of
the raster

Źródło: A CADASTRAL MAP IN POLAND - THE PROPOSAL BASED ON ANALYSIS OF CADASTRAL MAPS IN SELECTED COUNTRIES - Marcin Karabin, Robert Łuczyński, Magdalena Karabin-Zych (17 International Multidisciplinary Scientific GeoConference SGEM 2017, 27 June - 6 July, 2017 Albena Bulgaria)

***Defining new cadastral maps combining vector and raster data (aerial photographs)
and the terrain relief model***

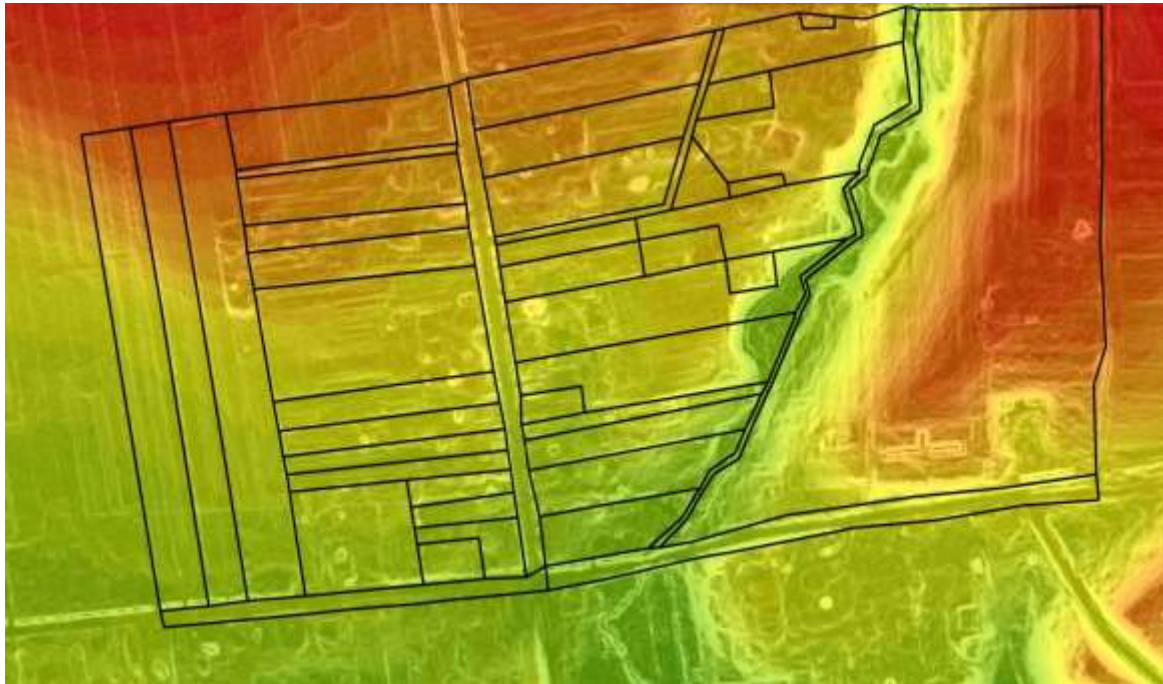


Semitransparent map of slopes imposed on orthophotomap and cadastral data

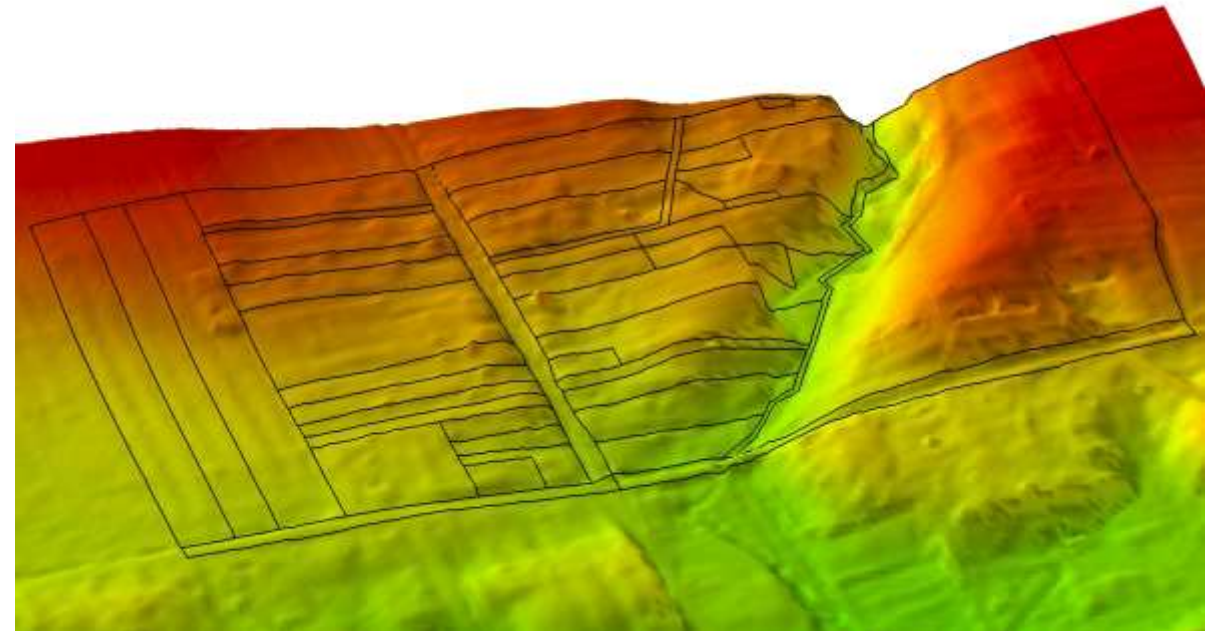


Cadastral data on the background of DTM from ISOK project (ALS) about 6points/sqm ($m_h \leq 0,15m$)

***Defining new cadastral maps combining vector and raster data (aerial photographs)
and the terrain relief model***



Cadastral data on the background of
hypsometric map



Cadastral data on the background of DTM from ISOK
project (ALS) about 6points/sqm ($m_h \leq 0,15m$)
with colour-coded elevation

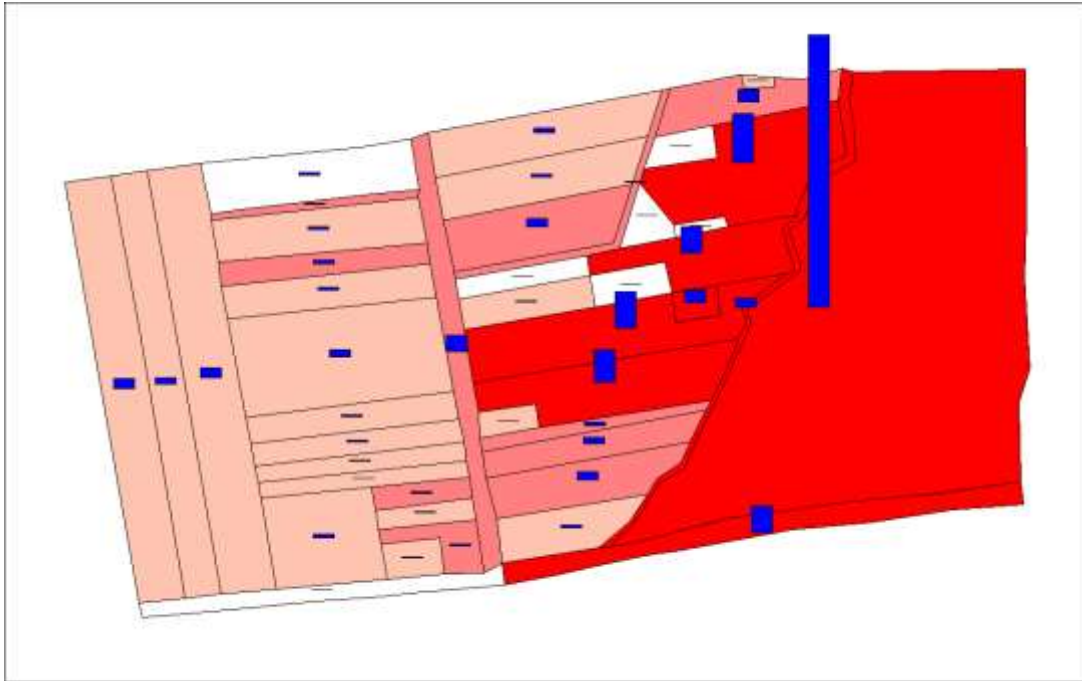
Accuracy of the area of parcel depending on BPP attribute

(BPP – the mean error of the boundary point in relation to the 1st class control points network)

Area Sqm.	BPP	<i>mean error of the area of parcel depending on shape of parcel:</i>				
		<i>1:1</i>	<i>1:3</i>	<i>1:5</i>	<i>1:10</i>	<i>1:15</i>
1000	0.10 m	3	4	5	7	15
5000		7	9	11	16	19
10000		10	13	16	22	27
1000	0.60 m	19	24	31	43	52
5000		42	55	68	95	116
10000		60	78	97	135	165
1000	3.00 m	95	122	153	213	260
5000		212	274	342	477	582
10000		300	387	484	674	823

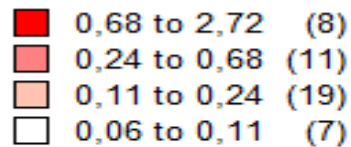
Source: Radzio W. (2016): „Granice nieruchomości w świetle przepisów dotyczących ewidencji gruntów i budynków” materiały szkoleniowe Stowarzyszenie Geodetów Polskich, Warszawa 7.12.2016r.

The area of parcel registered in cadastre vs. surface determined by means of 3D analyses

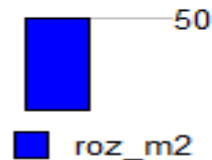


Source: by
R. Olszewski

obszar1 by proc_rozn



Bar Chart of obszar1



id	pow_2D	pow_3D	roz_m2	proc_rozn	a_NumCells_Value	a_Range_Value	a_StdDev_Value	a_Volume_1
22	3 719,00	3 723,42	4,4	0,12	3 719	1,61997	0,369521	487 450,3
37	3 846,00	3 850,43	4,4	0,12	3 848	2,6301	0,565273	506 339,2
3	1 544,00	1 545,82	1,8	0,12	1 544	1,14008	0,206083	197 206,1
40	9 782,00	9 794,80	12,8	0,13	9 781	8,60988	2,52828	1 265 571
41	6 570,00	6 578,30	8,3	0,13	6 569	8,54997	2,50325	847 770,7
5	4 355,00	4 360,56	5,6	0,13	4 353	1,96991	0,37073	552 178,9
2	2 039,00	2 041,89	2,9	0,14	2 038	1,51984	0,225293	260 969,1
1	2 405,00	2 408,30	3,3	0,14	2 406	1,87004	0,248556	308 898,9
42	8 373,00	8 385,32	12,3	0,15	8 374	8,40003	2,33355	1 077 542
35	2 947,00	2 951,55	4,6	0,15	2 948	2,11	0,495777	384 423,6
26	611,00	611,98	1,0	0,16	611	1,13982	0,155527	77 705,9
30	2 414,00	2 417,85	3,8	0,16	2 412	1,61998	0,407513	300 717,6
23	4 208,00	4 214,66	6,7	0,16	4 207	2,16991	0,357752	554 063,2
45	156,00	156,31	0,3	0,20	156	0,580032	0,144343	20 475,44
7	844,00	845,71	1,7	0,20	845	1,41013	0,266385	106 897,8
8	892,00	893,93	1,9	0,22	892	1,41998	0,339236	112 591,4
36	2 013,00	2 017,87	4,9	0,24	2 010	2,22983	0,471029	263 381,1
21	4 006,00	4 016,22	10,2	0,25	4 006	2,20001	0,472091	522 323,1
9	1 206,00	1 209,07	3,1	0,25	1 205	2,2301	0,4349	151 783,2
24	1 010,00	1 012,64	2,6	0,26	1 011	1,8602	0,46091	131 381,3
39	725,00	727,04	2,0	0,28	725	2,51	0,712565	95 737,04
29	3 276,00	3 286,25	10,3	0,31	3 276	2,43995	0,585899	410 875,7
28	2 499,00	2 507,72	8,7	0,35	2 498	3,36991	0,745155	315 758,8
6	919,00	922,50	3,5	0,38	919	1,52011	0,287254	116 836,1
27	1 184,00	1 189,27	5,3	0,44	1 184	3,88017	0,807331	150 305,2
44	3 675,00	3 695,46	20,5	0,55	3 674	7,49003	1,96231	471 707,5
25	2 758,00	2 773,96	16,0	0,58	2 758	6,01014	1,08917	359 671,2
31	46 890,00	47 211,36	321,4	0,68	46 892	11,5201	3,07441	6 133 196
15	6 131,00	6 174,79	43,8	0,71	6 131	6,00001	1,44565	784 747,8
32	1 628,00	1 639,81	11,8	0,72	1 626	2,98003	0,646038	203 521,9
33	4 403,00	4 435,34	32,3	0,73	4 403	5,43011	1,58831	558 570,7
12	5 214,00	5 253,51	39,5	0,75	5 216	4,96992	1,38135	665 334,8
14	6 425,00	6 482,96	58,0	0,89	6 425	5,94995	1,16585	833 765,1
10	3 552,00	3 584,16	32,2	0,90	3 553	5,21998	1,31807	457 442,1
16	574,00	590,05	16,0	2,72	574	4,47005	0,7875	73 749,88

Source: by R. Olszewski

Geo-visualisation of data concerning premises

- *It should be possible to present the geometry of premises in a unified coordinate system together with other cadastral data and to develop the correct cartographic visualisation.*
- *The developed model should be an element of a building data model, utilised for different purposes: management of a building, crisis management, indoor navigation systems, the real estate cadastre.*
- *It is proposed to enter data at least at two accuracy levels: with representation of whole premises and with representation of rooms.*

Geo-visualisation of data concerning premises

- *The boundary line of premises (which is the outer wall) is drawn along its external edge (at the floor level). Lines being boundaries between two premises are drawn on the axis of the separating wall.*
- *Boundary lines of rooms are drawn on internal edges of wall at the floor level.*
- *Rooms are separated into sub-spaces due to the different method of calculation of the useful space (in Poland another coefficient is applied for calculated room sizes for the room height above 2.20 m (100%), the height between 1.40m and 2.20m (50%) and for some rooms of the heights lower than 1.40m (0% - not considered in calculations).*
- *Data is acquired and recorded in the coordinate system applied in the given cadastral system (in order to achieve the full compliance with data for the building surrounding areas).*

Generation of 3D models of premises, using the architectural projections of premises

Architectural projections of premises
Local Coordinate System

3D models of premises
State Coordinate System

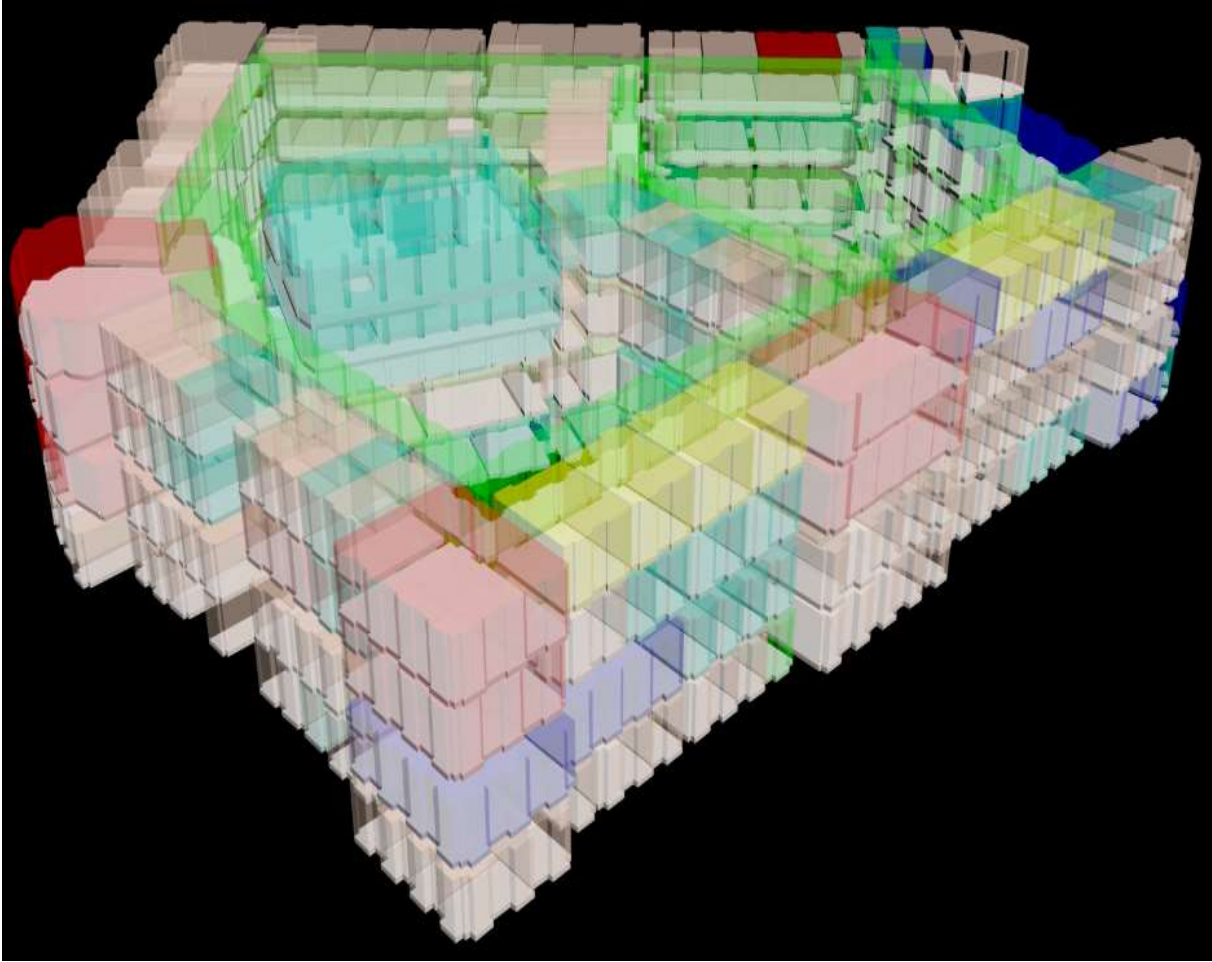
BUILDING OUTLINE ACQUIRED AS A RESULT OF FIELD MEASUREMENTS

- *verified whether the geometric features of object is compliant with the building design documentation*
- *appropriate corrections*
- *Set of the data in Local Coordinate System e.g. according to BISDM Standard*

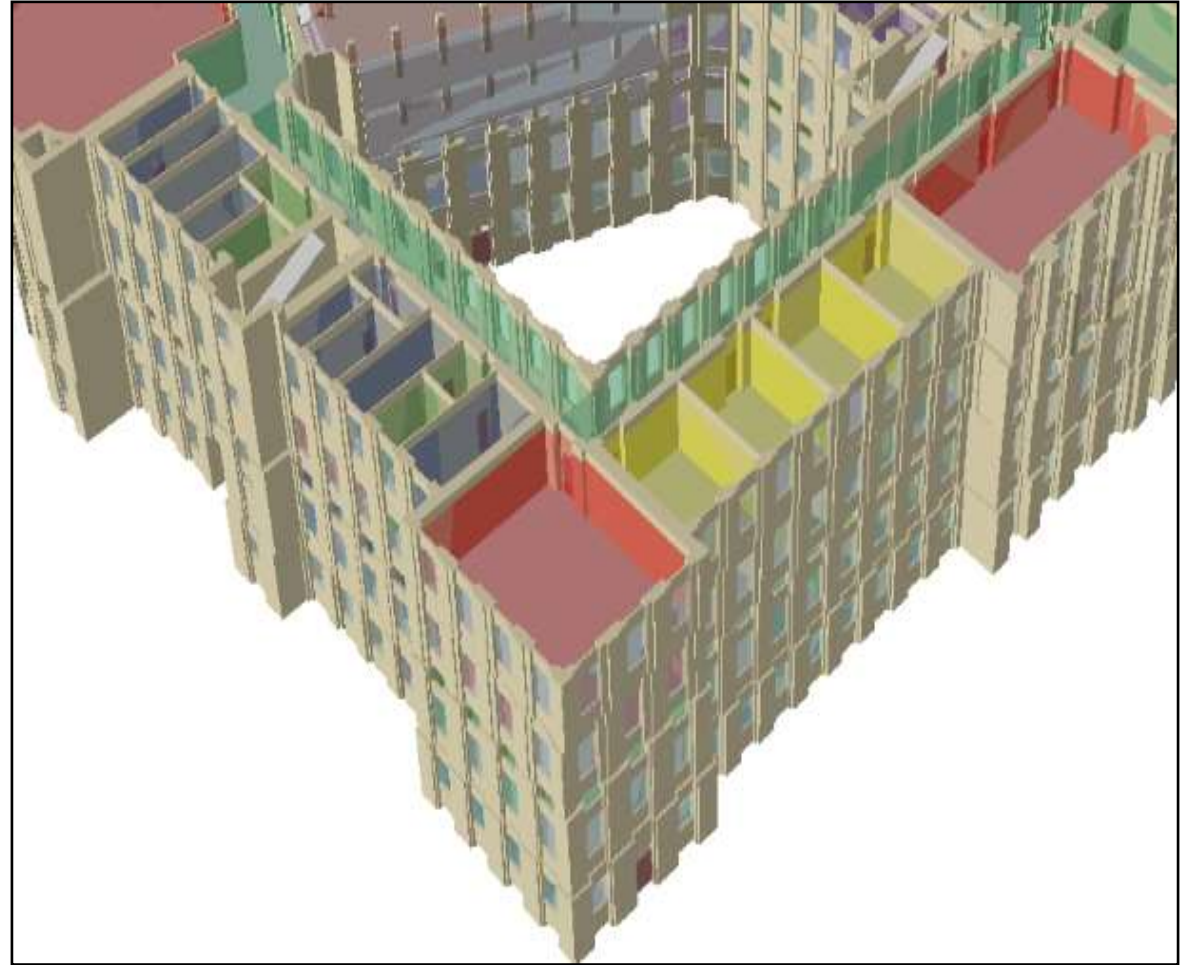
VARIANTS OF MATCHING INTO STATE COORDINATE SYSTEM

- *Helmert transformation*
- *transformation based on splines.*
- *the bilinear transformation*
- *basing on one corner of the building and the azimuth of one wall*

Geo-visualisation of data concerning premises

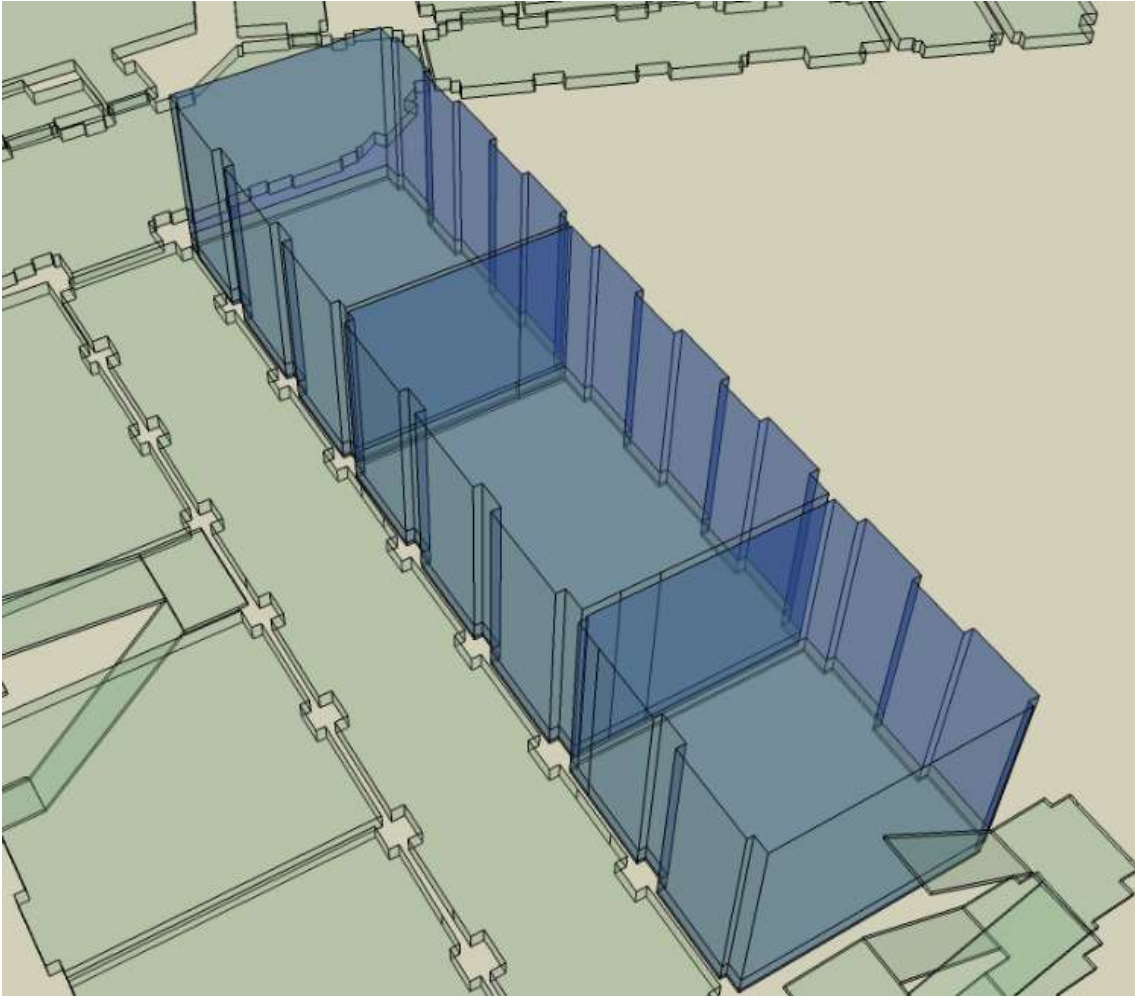


Source: authors



Source: authors

Geo-visualisation of data concerning premises

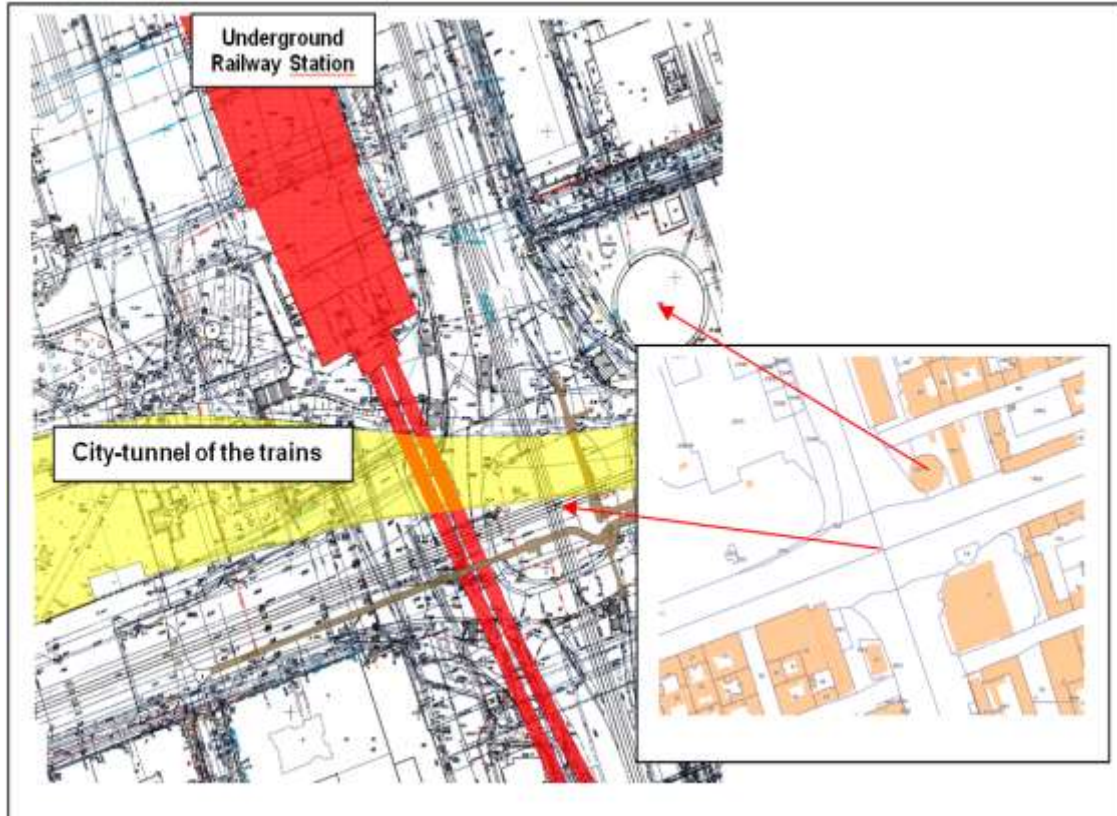


Source: authors



Source: authors

Geo-visualisation of data concerning untypical objects in the cadastre – e.g. subway tunnels



Karabin M. : „Rules concerned registration of the spatial objects in Poland in the context of 3D cadaster’s requirements” 2nd International Workshop on 3D Cadastres, 16-18 November 2011, Delft, the Netherlands



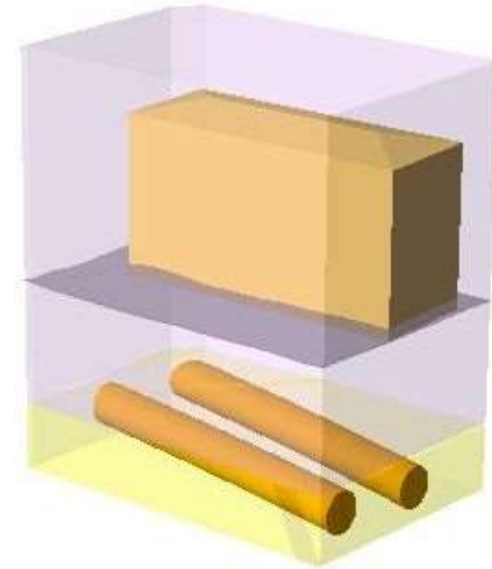
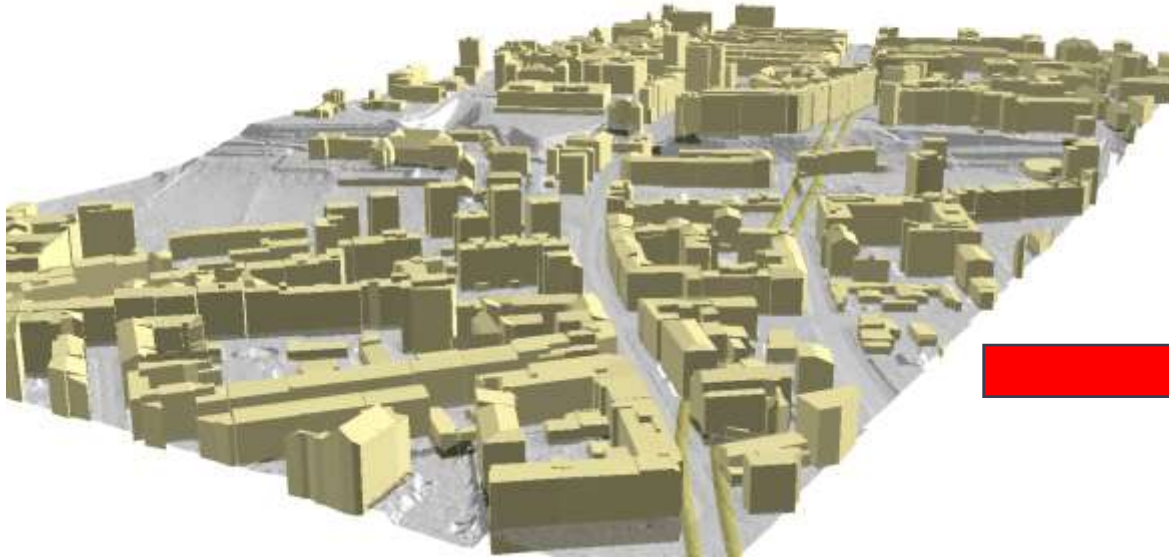
Press relations

NO LAYER APPROACH IN CADASTRE !!!

IT IS NOT POSSIBLE TO SELL PARCEL ABOVE SUBWAY TUNNEL !!!

IF WE SELL PARCEL – THE SUBWAY WILL BE ALSO SOLD!!!

Geo-visualisation of data concerning untypical objects in the cadastre – e.g. subway tunnels



*Laser scanning of subway tunnels
Two tunnels - length 950m each one*

970 sections generated every 0,2-1,5m => 8 points generated

ALS from ISOK project - about 12points /sqm (mh<=0,10m)

3D City Model from classified cloud of points (buildings class)

CityGML standard LoD2 , level of detail of objects approx 0.5 m.

Matching with cadastral data

Source: by K.Bakuła and A.Fijałkowska

THANK YOU FOR YOUR ATTENTION