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Study of Old City Plan With Help of Historical Ontology of Urban Spaces – Legend Reconstruction

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Abstract:

Project Historical Ontology of Urban Spaces (HOUSe) aims at developing domain ontology (also referred to as urbanonto), which represents concepts related to historical cities. In recent years ontologies have been successfully implemented in historical research (Southall and Aucott 2019; Szady 2020). The HOUSe ontology models definitions of terms, responding to the needs of the research community for comparable specialist terminology, which is essential for comparative urban studies by conditioning mutual understanding of researchers (Denecke 2017). The upper level ontology for the urbanonto ontology is CIDOM-CRM. The urbanonto is based on the modern model of a database – that is the Database of Topographic Objects used officially in Poland. It benefits also from the ontohgis ontology, a domain ontology collecting information on historical administrative units (Szady 2020). Researchers participating in the project supplemented the list of terms from the modern database with types of objects existing in the cities in the past. One of the advantages of our approach is that for the territory of Poland it will allow for comparative research of historical space and contemporary space for which data repositories exist. Application of ontology in relational databases is profitable for effective data retrieval and sharing of information and knowledge (Fonseca et al. 2000; Munir and Sheraz Anjum 2018). The HOUSe ontology was used to develop the database model for collecting data about objects in the city.

The main case study in the HOUSe project is the city of Warsaw. The essential cartographic source for this area is the city plan on the scale of 1:2,500 (Figure 1). It was elaborated in the second half of the 19th century under the direction of William Heerlein Lindley in connection with the construction of water supply and sewage systems (Żelichowski and Weszpiński 2016). W.H. Lindley was a British engineer who supervised similar works, e.g. in Czechia or Romania. At that time in Warsaw, a whole series of plans in various scales were created. These were the first fully cartometric plans based on geodetic control network points. However, no legends were attached to the plans on scale of 1:2,500. A small number of examples of symbols (named as 'conventional signs') used on the maps appeared only on two different sheets in the 1:1,000 scale.

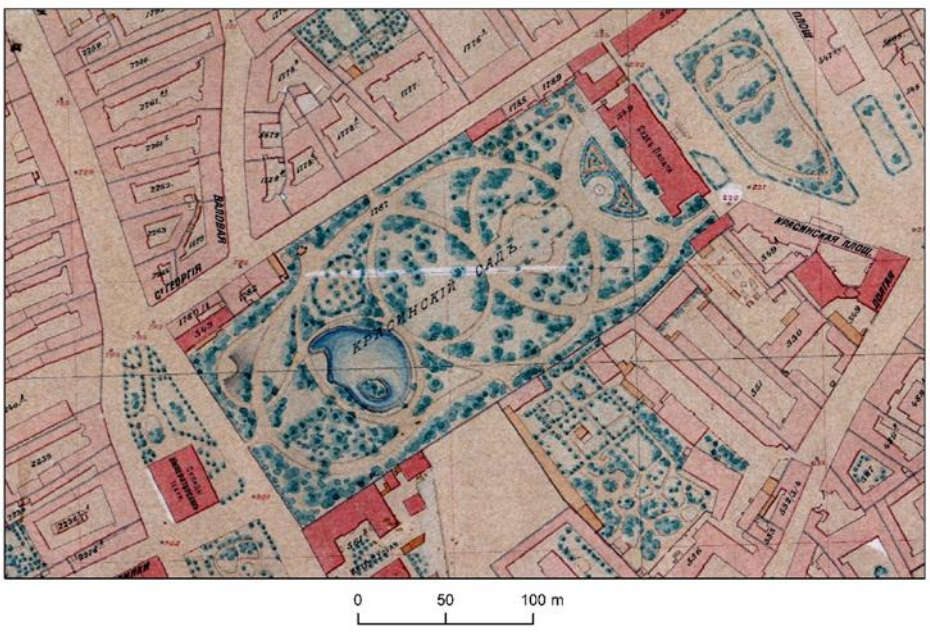

Figure 1. Fragment of Lindley's plan at a scale of 1:2,500 (State Archive in Warsaw, 72/1001 sig. 785, sheet no 11)

As of today, the HOUSe ontology consists of 286 object types and is constantly developed with the progress of the project. The above-mentioned two sets of symbols used on Lindley's plans contain far fewer object types. One of the sheets presents only 11 symbols, and the second one 15 (Table 1). These two sets of cartographic symbols constituted the basis for the reconstruction of the legend of the plan on the scale of 1:2,500 used in the project. Four symbols appear in both sets (farmlands, waters, roads, ditches&canals), resulting in 24 unique symbols. At the current stage of the urbanonto

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development set of symbols from Lindley's plans could be mapped to 14 types of objects from HOUSe ontology (Table 1). However, much more symbols appear throughout the sheets of the plan on a scale of 1:2,500. What is more, a noticeable distinction with regard to the symbols of buildings could be made. Another important problem in relation to the analysis of urban tissue is the ambiguity of the line symbols of the borders between plots.

symbols from Lidleys' plans	**object types from HOUSe ontology**
buildings	building
estates	property
gardens	garden
cultivated gardens	cultivation on arable land
farmlands	
meadows	grass
overgrown meadows	
dry meadows	
wet meadows	
pastures	
overgrown pastures	
thickets, shrubs	shrub
alder forest	forest
oakwood	
pine forest	
swamps&wetlands	swamps
sands	sandy or gravel ground
roads	road
chaussee	
alleys	alley
waters	surface water
ditches&canals	drainage ditch/canal
wastelands	the remaining unused land
fallows	

Table 1. Attempt of mapping symbols from Lindley's plans to object types from the urbanonto (own elaboration).

In conclusion, it is worth harmonizing the data from different time periods in order to conduct systematic studies of urban space through history. The work on a larger scale can positively contribute to comparative studies of cities. The key issue is the consistency of understanding of concepts by researchers from different countries, and this consistency can be achieved through ontology. Systematic work on the extension of the ontology with objects from the past shows which objects are no longer present in the city space, and enables the study of the continuity of objects as well as the continuity of space.

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