Abstract

It turns out that for most users of spatial data presents a harmonization of data (as an elimination of heterogeneity) as the greatest problem – a transformation their own data sets to the data specifications produced by the INSPIRE Directive so as not to limit current processes processing, management, sharing and presentation of data. Therefore, they need the widest possible description of spatial data, because it will only eliminate the problems of heterogeneity.

The author of this Ph.D. thesis dealt with the opportunities which ontologies bring to the process of data modelling. The aim was to describe using ontologies the selected part (classification systems) of data models of spatial data themes "Land Cover" and "Land Use" which are defined in Annexes II and III of the INSPIRE directive. Developed ontologies serve as a source of information on classification systems. Their evaluation (so-called reasoning) will provide new information (relationships between taxonomy elements) that play an important role in the transformation process of classification systems as part of the harmonization of spatial data.

Creating of ontologies consisted of three main steps – selection of appropriate methodology, development of a basic ontology structure and iterative process of populating and specification of ontologies. After the search procedures used to realize domain ontologies a combination of methodologies On-To-Knowledge, METHONTOLOGY, and Uschold & King have proved to be the most appropriate. Based on these methodologies the uniform structure of ontologies describing classification systems have been created. These files contain a list of all items of the taxonomy, the parameters specifying these elements, allowable values of these parameters and relations assigning parameter values to the elements of classification systems. The next phase was focused on testing of selection parameters, their values and way of assignment. This so-called "control ontologies" verified the initial hypothesis on a limited data set or an external reference source. The last step was to interconnect each of the particular ontology and their subsequent evaluation. A new system shows the relationships between elements of classification systems.

The results of the Ph.D. thesis can be divided into three groups – development of domain ontologies and description of domain (testing of software and proposed methodology, especially the iterative process of "control ontologies"), description and transformation of classification systems using the ontologies (the application is open, modular therefore it may in future be extended and modified), and proposal of applications of the created ontologies in data modelling (with respect to the INSPIRE Directive).

The conclusions of the Ph.D. thesis indicate that the ontologies have their unique place in the process of data modelling, harmonization of spatial data and therefore also in the implementation of the INSPIRE directive. Ontologies do not represent a strict form of description data, such as UML diagrams or database schemas. It makes them suitable for storing such information, which, for its generality could be defined just as an unstructured text strings in other types of data models. Ontologies are not possible to saturate the complete process of data modelling, but along with other similar tools they can generate very strong platform serving to reduce the heterogeneity of data and its consequences.