A Hybrid Approach for the Integration of heterogeneous Data in the Urban Planning Domain

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Abstract

A crucial element in the data integration is the use of semantics, which describes explicitly the meaning of a term or a concept and the relationships between them. One of the domains where data integration is of particular importance is urban planning. Spatial planning products, which are mainly spatial development plans provide public information and must be published on the internet. The heterogeneous nature of plans is an obstacle in effective sharing, integration and extensive use of these documents. In the absence of common standards that would provide a method of recording and publication of plans, their integration is very difficult. This causes a situation in which spatial development plans may not be analyzed or compared in a wide scale. This can cause a lot of social conflicts and negative phenomena in the spatial development.

The aim of the authors is to use ontologies for integrating many heterogeneous spatial development plans. For this purpose the hybrid-ontology approach is used. The integration process involves three main steps: the development of a domain ontology for semantic representation of spatial development plans, development of local ontologies and defining the mappings between ontologies. The creation of a domain ontology , which represents a common model for all spatial plans is not an easy task, since the range of information contained in these documents is very broad. It seems impossible to describe all the issues that are considered in plans. Hence the assumption of the authors is to develop the ontology in a way that will constitute a universal and easily extensible model. According to the hybrid-ontology approach, local ontologies are created for each data source. In the case presented by the authors, each plan is a separate data source which is described by its own terminology. The local ontology may be generated automatically, e.g. when the plan is represented as structured spatial data, tools which allow for the transformation from relational to ontological form can be used. The document of a spatial development plan may also be annotated with RDFa. Annotations can then be considered metadata, where terminology from domain ontology is used. In the presented use case mappings are defined in a semi - automatic manner with the use of SPIN rules. For this purpose SPINMap vocabulary is used, which is a collection of patterns for best practices in ontology mapping. Population of ontology is done using mapping rules, but only a few connections are required. Many of the assertions are made automatically through logical reasoning.

A semantic representation of spatial development plans is a step to the next stage which is their publication as a Linked Open Data cloud. Developing a comprehensive standard for recording spatial plans is very difficult. Creating a possibility to share them using ontologies, can be a good way of providing this kind of information.