Chapter 8
Semantically Enriched POI as Ontological Foundation for Web-Based and Mobile Spatial Applications

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ABSTRACT

While developing a Web-based travel planning system, the necessity to implement a mobile component has been identified. Such a conception is aimed at a comprehensive support of a workflow that enables users to plan a trip in advance using the Web-based application, but to modify the original plan whenever and whenever they want while carrying out the journey. Within both components, Point-of-Interest (POI) plays a significant role to determine a tour. It is one claim of this chapter that the relevance of POI is dependent on the perspective of a user. As a consequence, the originally used POI database was replaced by a POI ontology which promised to support the workflow more comprehensively. This conceptual change raised several questions concerning the domain dependence of the POI ontology on the one side and universal aspects of the ontology on the other.

INTRODUCTION

Research on semantic interoperability during the last decades has resulted in various proposals on how to capture semantics for computerized applications. A challenging question is still how to transform ontological specifications into formal descriptions effectively. Such formal ontologies should be usable by computers, and therefore in running spatial applications. In such applications, ontologies can serve as comprehensive data descriptions, including not only names of and named relations between objects, but also their meaning. Furthermore, ontologies are seen as means to support knowledge sharing and reuse, and therefore interoperability between different applications (Fonseca, et al., 2001).
The philosophical term Ontology, and the term ontology, the latter also having a plural, ontologies, are different issues. In the original sense, ontologies cannot exist because there is one, and only one, Ontology. In such a sense, Ontology is related to Aristotle’s word category, which the Greek philosopher used for classifying anything that can be said or predicated about anything (Sowa, 2009).

Since the term is also used in computer science, it has been applied in another sense, indicating that there are different ontologies. The philosophical term includes the description and explanation of the whole in a universal sense. The term as used in computer science indicates another viewpoint. Ontologies are not meant as a description of the universal environment, the term environment including the natural and human-made world. Due to the large complexity and infiniteness of such an environment (the whole), computer scientists have taken a more pragmatic approach. This says that ontology describes a Universe of Discourse (UoD). Such a UoD is specific for a group of people, or Information Community (IC). This way, ontologies describe only parts of the universe. They represent a limited world view. This limitedness is due to the specific perspective, and requirements, of an IC. This is also true for Geographic Information Communities (GICs) that have specific goals and tasks which reduces their perspective on only such objects, their properties, and relations, etc., that are relevant to achieve these goals. In such a sense, there is no difference between the term ontology, and the term mini world, used in database theory. Mini worlds represent only small parts of the complex, universal world. Their advantage is that they are small enough to model and formalize them adequately in computerized environments. In Artificial Intelligence (AI), the usage of formal ontologies, instead of databases, has become popular due to their capability to describe a certain reality with a specific vocabulary, using a set of assumptions regarding the intended meaning of the vocabulary words (Horrocks, 2008; Fonseca, et al., 2001; Smith & Mark, 1998).

The difficulty, or impossibility, to model the comprehensive, implicitly infinite whole, makes it necessary to take a pragmatic view concerning ontology. Instead of modeling the entire natural and human entities, their relationships, as well as interferences between humans, nature, and laws, rules, regulations, institutions, etc., it is pragmatic to select only parts of it and describe these in a manner that fit the requirements of a user. This means to appreciate that a model is incomplete, and only usable in a (one) defined environment. The vocabulary used to describe such a model must be enriched by the explanation of the assumptions of the intended meaning that underlie the terms in use. This coincides with describing ontology as a technical term denoting an artifact that is designed for a purpose, which is to enable the modeling of knowledge about some domain, real or abstract (Gruber, 2008; Smith & Mark, 1998).

The question, whether it is reasonable to design universal ontology of geographic space, or concentrate on limited, and incomplete, but efficient models, occurs necessarily in such a framework. Well defined, but limited, ontologies have been identified as manageable, usable and effective. Large, highly abstracted ontologies seem to be hard to develop, difficult to manage, and therefore nearly impossible to be applied. A universal ontology would serve as a foundation of each existing concept of geographic space and therefore—in a formal version—as foundation for nearly all computerized spatial applications. An idea like this represents a top-down-approach: the universal ontology stands on the highest level of abstraction, whereas all concepts and models in whatever spatial field are derivations.

The opposite, a bottom-up-approach, represents the one taken in many research projects until recently. Designing small, well-defined ontologies, limited in scope but therefore easier to manage, represents a pragmatic approach toward ontology.

Both concepts, top-down, and bottom-up, should be part of the discussion on universal