

Structure-based Analysis and Modularization of Ontologies

Gökhan Coskun

Freie Universität Berlin
coskun@inf.fu-berlin.de

Component-based development of large and complex software systems by small well defined building blocks improves the comprehension as well as the management and leads to reusable software modules and a scalable overall system. Accordingly, designing ontologies in a modular way is intuitively promising in order to benefit from the same advantages. However, the state of the art in ontology engineering is the usage of monolithic ontologies. For that reason the number as well as the size of available ontologies has increased with the growing utilization during the last years. In order to improve the efficient usage (e.g. through scoped reasoning for reasoners), to simplify the maintenance (e.g. through refactoring support) and to allow reusable components (e.g. through increased human understandability) there is a need to modularize large ontologies into well-sized building blocks in a (semi-) automatic way. Especially from the viewpoint of the Semantic Web reusability is a crucial issue because an agreed common semantic model allows easy data integration and interoperability.

Considering ontologies as networks of concepts connected through properties, network analysis techniques are a promising approach to evaluate and modularize ontologies. As a very well established discipline in science there are a lot of sophisticated methods and tools for network analysis available. We believe that these methods can be modified and applied to ontologies, so that the ontology structure can be used to analyze the content and to identify regions, which can be seen as network “communities” and can be extracted as modules. Furthermore, we are convinced that structure analysis enables a first evaluation of the usability by allowing different views, so that existing ontologies can be easier comprehended by ontology engineers. This is very important because refactoring and reusing of existing models assume that these models are understood.

This work investigates on how network analysis techniques and network measures (e.g. node centrality, betweenness, density, similarity) can be applied to ontologies and aims at gaining insight to which extent structure based techniques can be modified so they are paying attention to the semantics inherent in ontologies. The expected contribution is a method and tool support for ontology engineers to analyze and modularize ontologies in a (semi-) automatic way. The main goal is to improve the usability and maintainability by increasing the understandability and allowing ontology engineers to refactor and reuse existing ontologies easily.