

# Development of a Conceptual Map Generation Tool for Exploring Ontologies

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**Abstract.** This paper discusses a conceptual map generation tool for exploring ontologies. It extracts concepts from an ontology and visualizes them in a user-friendly form, i.e. conceptual map, in which the user is interested. It helps users to understand the extracted knowledge from the ontology, and contribute to integrated understanding of ontologies and domain dependent knowledge.

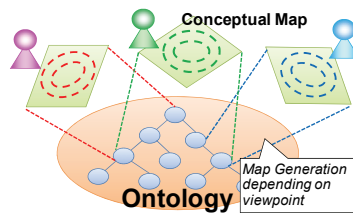
**Keywords:** Ontology exploring, View point, Conceptual map

## 1 Introduction

Ontologies are designed to provide systematized knowledge and machine readable vocabulary of domains for Semantic Web applications. It is important that the ontology captures the essential conceptual structure of the target world as generally as possible. However, such ontologies are sometimes regarded as verbose and divergent descriptions by domain experts because they often want to understand the target world from the domain-specific viewpoints in which they are interested. In many cases their interests are different, even if they are experts in the same domain. Therefore, it is highly desirable to have not only knowledge structuring from the general perspective but also from the domain-specific and multi-perspective perspective so that concepts are structured for appropriate understanding from the multiple domains. On the basis of this observation, we developed a conceptual map generation tool for exploring ontologies. The tool extracts concepts from an ontology and visualizes them in a user-friendly form, i.e. conceptual map, depending on the viewpoints that the users specify. The tool bridges the gap between ontologies and domain experts, and it can contribute to effective utilization of ontologies.

## 2 A Conceptual Map Generation Tool for Exploring Ontologies

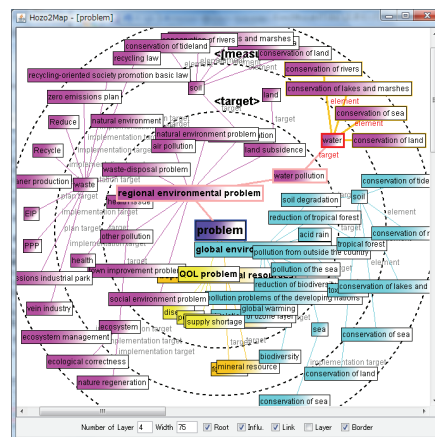
Fig.1. outlines the conceptual map generation tool that extracts concepts from an ontology and visualizes them depending on the viewpoints in which the user is interested. We define the viewpoint as the combination of a focal point and an aspect. The focal point indicates a concept to which the user pays attention as a starting point of exploration. The aspect is the manner in which the user explores the ontology. Because an ontology consists of concepts and relations among them, the aspect can be represented by a set of methods for extracting concepts according to its relations. We classify the relations into *is-a* relations and others, and define two methods in each



**Fig.1.** A Conceptual Map Creation Tool

**Table.1.** Aspects for extracting concepts

|     |                                 |
|-----|---------------------------------|
| (1) | Extraction of Sub-Concept       |
| (2) | Extraction of Super-Concept     |
| (3) | Extraction of Referring-Concept |
| (4) | Extraction of Referred-Concept  |
| (5) | Extraction of Context           |
| (6) | Extraction of Role Concept      |
| ... | ...                             |



**Fig.2.** An Example of Conceptual Map

relationship according to the direction to follow it (upward or downward). We also defined another methods based on an ontological theory of role [1]. As the result, the system obtains conceptual chains that fit in with the user's interest. The conceptual chains are visualized as a conceptual map. In the conceptual map, the focal point is shown in the center of the map and conceptual chains are represented as a divergent network. The nodes of the network indicate that the extracted concepts and links between them represent different aspects of tracing, i.e., followed relationships and selected concepts (Fig.2). The system can generate conceptual maps based on any viewpoint and helps users to understand the extracted knowledge from ontologies. The tool has some supplementary functions for supporting users such as highlighting focused chains, viewpoint management etc. Through these functions, the user browses multiple conceptual maps generated from the ontology based on various viewpoints. It supports users' understanding of the target world systematically across domains.

### 3 Conclusion and Future Work

The conceptual map generation tool has been used by domain experts of sustainability science (SS) for knowledge systematization. Because SS consists of various domains, it is important to understand the domain knowledge comprehensively [2]. Our tool contributes to help the experts explore the sustainability ontology from several focal points to eventually obtain integrated understanding of ontologies. Future work includes evaluating and improving the system through feedback from the experts.

### References

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