Development of a Conceptual Map Generation Tool for Exploring Ontologies

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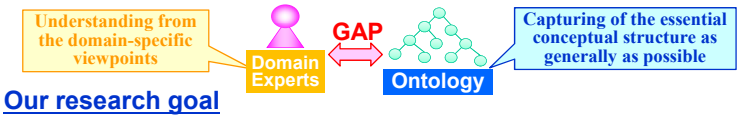
Background and our research goal

Background

■ ***Ontology:*** It is important that the ontology captures **the essential conceptual structure** of the target world as generally as possible.

■ ***Domain experts*** 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.

⇒ ***Ontologies are sometimes regarded as verbose and divergent descriptions by domain experts.***



Our research goal

■ ***Development of a conceptual map generation tool for exploring ontologies.***

- The tool structures knowledge of the target world from the domain-specific and multi-perspective perspective so that concepts are structured for appropriate understanding from the multiple domains.
- It bridges the gap between ontologies and domain experts and can contribute to effective utilization of ontologies, and it contributes to integrated understanding of ontologies and domain dependent knowledge.

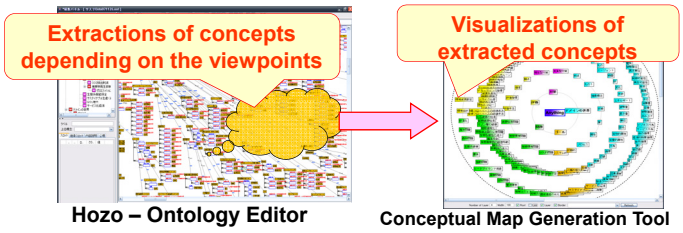
Research Topics

Extractions of concepts form ontology

■ How to extract concepts from an ontology depending on the viewpoints that the users specify.

Visualizations of extracted concepts

■ How to visualize extracted concepts in a user-friendly form.



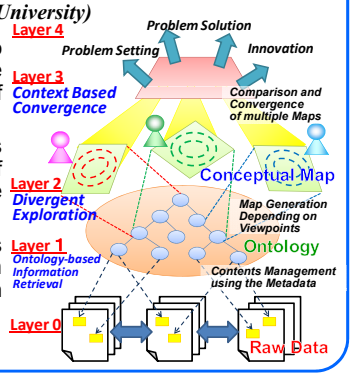
Application of the tool in sustainability science (SS)

Collaborator: T. Kumazawa (RISS,Osaka University)

■ Sustainability science (SS) is important to understand the domain knowledge comprehensively because it consists of various domains.

■ The conceptual map generation tool has been used by domain experts of sustainability science (SS) for knowledge systematization.

■ Our tool contributes to help the experts explore the sustainability ontology from several focal points to eventually obtain integrated understanding of ontologies.

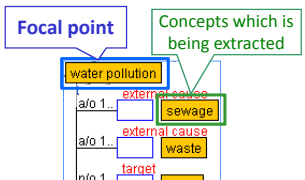


Conceptual Map Generation Tool

Extractions of concepts depending on the viewpoints

■ **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.
  It can be represented by a set of methods for extracting concepts according to its relations because an ontology consists of concepts and relations among them.

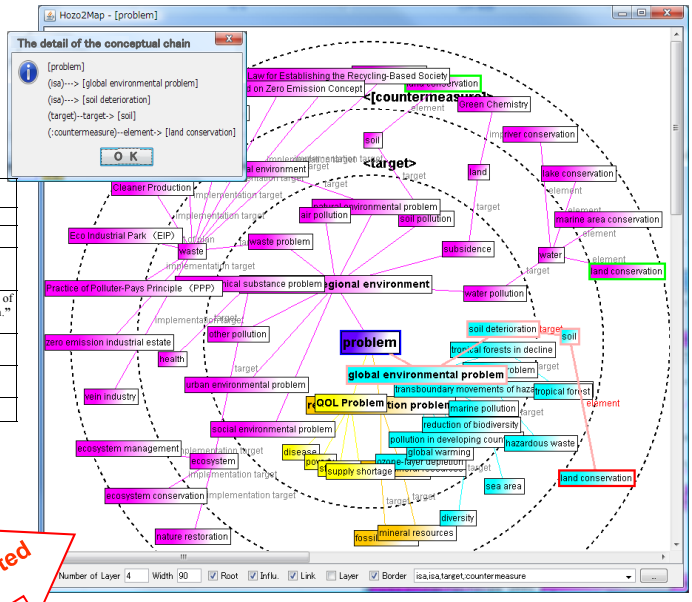


Ex.) (3)Extraction of concepts referring other concepts

Aspects for Concept Extractions (partly)

	Kinds of extraction	Related relationships	Commands in the tool
(1)	**Extraction of sub concepts**	***is-a* relationship**	**isa**
(2)	**Extraction of super concepts**	***is-a* relationship**	**super**
(3)	**Extraction of concepts referring other concepts**	***part-of/attribute-of* relationship**	**"Name of Roles"** which are interested in. (The delimiter is "|".) e.g., [target, target| place of occurrence]
(4)	**Extraction of concepts referred to**	***part-of/attribute-of* relationship**	**":A Category** (name of a super concept) of Concepts Referred to which are interested in." e.g., [:Problem], [:Countermeasure]
(5)	**Extraction of contexts**	***Depending on* relationship**	….
(6)	**Extraction of role concepts**	***Depending on* relationship**	….
	……	…..	….

Visualizations of extracted concepts

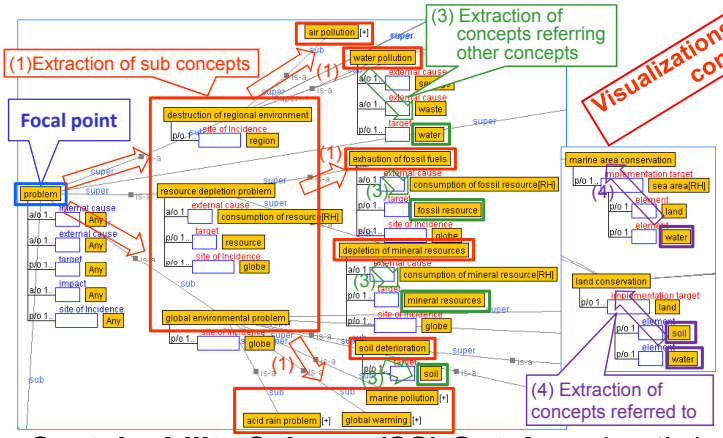


An example of concepts extractions

An example of viewpoint that the users specify

"What kinds of ***problems*** are defined in the SS ontology? What are their ***targets***? And, what ***countermeasures*** are considered? "

The focal point:
[Problem]
Aspects for extractions:
[isa,isa,target,:countermeasure]



Sustainability Science (SS) Ontology (partly.)

Visualizations of extracted concepts

The system can generate conceptual maps based on any viewpoint and helps users to understand the extracted knowledge from ontologies.

Other functions
- *-A highlighting of the focused conceptual chain.*
- *-Control of the range of exploration.*
- *-Linking conceptual map with data stored at Layer 0.*

Conclusions and Future Work

■ The conceptual map generation tool contribute to help the user eloper multiple conceptual maps generated from the ontology based on various viewpoints.

■ It supports users' understanding of the target world systematically across domains.

■ Future work includes evaluating and improving the system through feedback from the experts.