Divergent Exploration of an Ontology

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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.

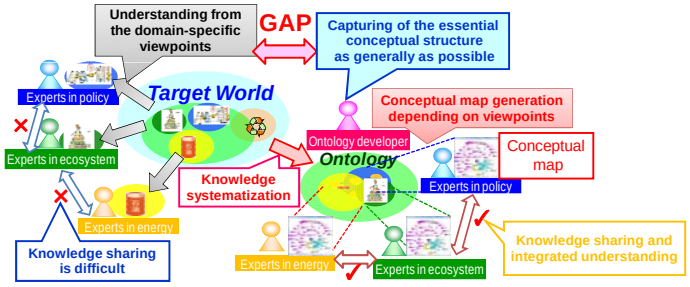
■***Domain experts*** often want to understand the target world from the **domain-specific viewpoints** in which they are interested. In many cases their interests are different, even if they are experts in the same domain.

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

Our research goal

■***Development of an ontology exploration tool***

- 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.



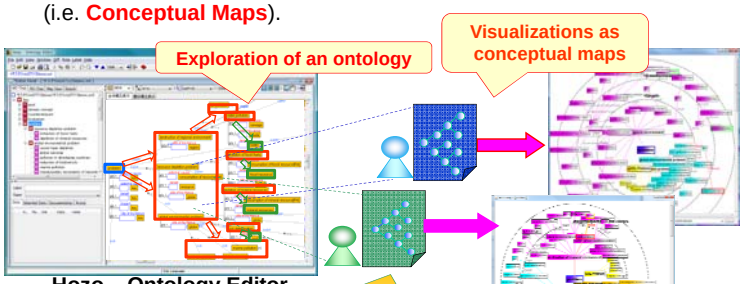
Divergent exploration of an ontology

1) Exploration of multi-perspective conceptual chains depending on viewpoints

■The users choose arbitrary concepts according to the their intention to obtain what we call **"multi-perspective conceptual chains".**

2) Visualizations of conceptual chains as a conceptual map

■The system visualizes the conceptual chains in a user-friendly form (i.e. **Conceptual Maps**).



Multi-perspective conceptual chains represent the explorer's understanding of ontology from the specific viewpoint.

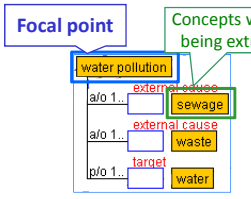
The divergent exploration in "the ocean of concepts" enables researchers to search for interesting concepts/relationships that have been hidden in the conventional unstructured world guided by divergent thinking across domains.

Ontology Exploration Tool

Exploration of multi-perspective conceptual chains 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

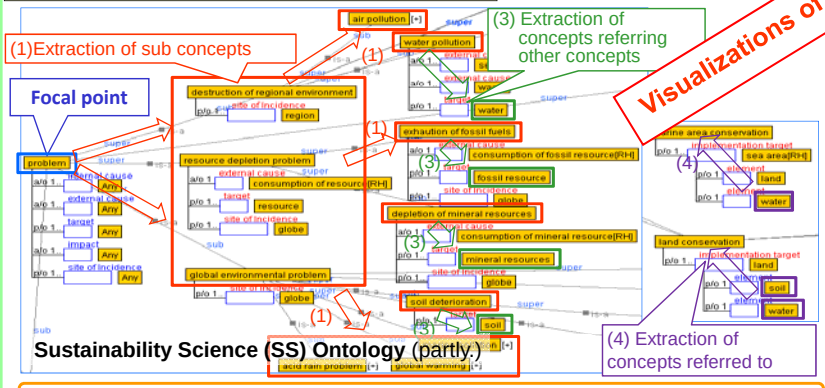
	Related relationships in Hozo	Related relationships in OWL	Kinds of extraction	
(A)	*is-a relationship*	*rdfs:subClassOf*	(1	*Extraction of sub concepts*
			(2	*Extraction of super concepts*
(B)	*part-of/attribute-of relationship*	*properties which are referred in*	(3	*Extraction of concepts referring*
			(4	*Extraction of concepts referred to*
(C)	*Depending on relationship*		(5	*Extraction of contexts*
			(6	*Extraction of role concepts*
(D)	*play(playing) relationship*		(7	*Extraction of player* (class constraint)
			(8	*Extraction of role concepts*

An example of exploration

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]



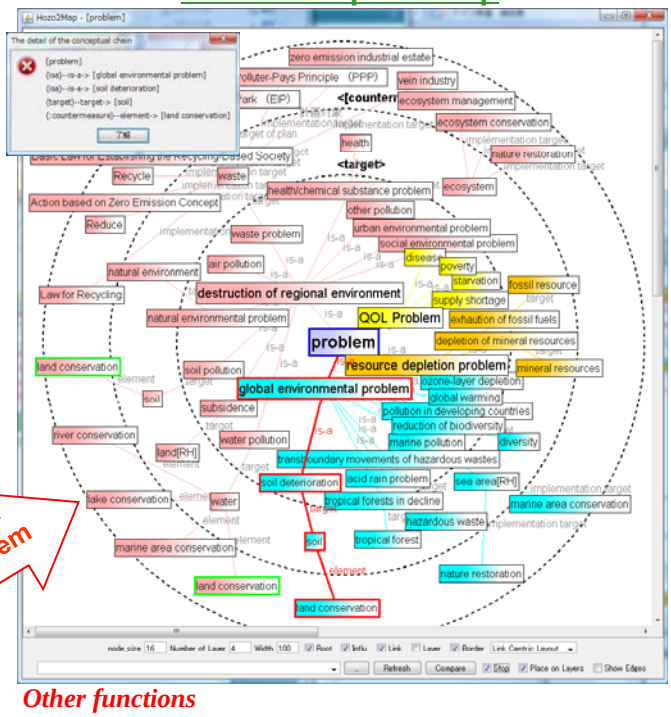
Application of the tool in sustainability science (SS)

Collaborator: T. Kumazawa (RISS,Osaka University)

■Because Sustainability science(SS) is consists of various domains, it is important for experts in each domain to understand it comprehensively.

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

Visualizations of conceptual chains as a Conceptual Map



Other functions

-A highlighting of the focused conceptual chain.

-Linking a conceptual map with other ontology-based systems.

Conclusion

■Multiple conceptual maps generated from an ontology based on various viewpoints support users' understanding of the knowledge systematically across domains.

■They would contribute to a discovery of unexpected causal chains that are not noticed by the explorers..

Future Work

■ A function for convergent thinking after collecting multi-perspective such conceptual chains divergently.
(e.g. A discovery of a trade-off between concepts)

■ Development of a supporting tool for ontology construction process using conceptual maps.