

Towards Ontology Mapping: DL View or Graph View?

Ontology is defined as “a formal, explicit specification of a shared conceptualisation”. In practice, ontology is usually considered as a set of concepts and their interconnections, including some rules of inference. Ontology can be represented in different mathematical models, two of which are description logic model and graph model.

DL Model

Description logic is a family of formal languages developed for “representing knowledge”. They are able to capture different kinds of relationships that can hold between concepts beyond the basic relationships such as is-a and part-whole relationships. The inference mechanism of DL enables drawing conclusions from the existing facts.

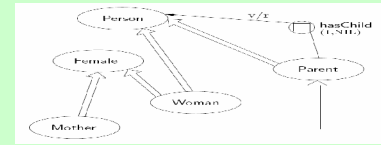
Women Person Female
 Mother Parent Female
 Parent Person (1 hasChild) · Person

Ontology Model

How can we apply ontology models to ontology mapping?

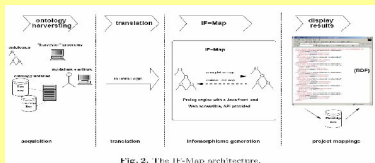
Graph Model

The graph representation, though less expressive, is often regarded as more attractive and effective from a practical viewpoint. The well developed graph theory provides a convenient mathematical vehicle for graph modelling.



IF-Map

The IF-Map refers to the Information-Flow based method for ontology mapping. The idea is to map one ontology with another via ontology morphism, which is defined as a set of mapping rules.



Ontology Mapping

How can we combine these approaches?

Similarities Network

Ontology mapping can be understood as concept mapping. Thus, it is important to calculate the similarity between the two concepts. Based on the concept similarity, we can further determine the most suitable way to map one ontology with another.

$$\text{sim}(x,y)=f(\text{sim}_1(x,y), \text{sim}_1(x,y), \dots, \text{sim}_k(x,y))$$

Further Work

While the DL approach can fully exploit the “semantic meaning” of the ontology, it exposes the disadvantage of exponential computational complexities. On the other hand, although the graph approach may not be able to calculate the complicated relationships between the ontologies, it presents a clear structure where mapping between the two ontologies can be carried out in a statistical fashion. In the future, we will try to combine the two approaches together to tackle the ontology mapping problem.

