

Using Concept and Structure Similarities for Ontology Integration

Xiulei Liu^{1,2}, Payam Barnaghi¹, Klaus Moessner¹, and Jianxin Liao²

¹Centre for Communication Systems Research University of Surrey
Guildford, Surrey, GU2 7XH, United Kingdom

²State Key Laboratory of Networking and Switching Technology
Beijing University of Posts and Telecommunications Beijing 100876, P.R. of China
{xiulei.liu,p.barnaghi,k.moessner}@surrey.ac.uk
liaojianxin@ebupt.com

Abstract. We propose a method to align different ontologies in similar domains and then define correspondence between concepts in two different ontologies using the SKOS model.

Introduction. Recently ontologies are created to provide knowledge representation. They use common representation languages such as OWL, but there are many heterogeneous ontologies [1–3]. In this paper we first propose a lexical and structural analysis and compute the concept similarity as a combination of attributes, second use the SKOS model to define correspondence between concepts[4].

Ontology Alignment Framework. To perform the matching between concepts in different ontologies, we focus both on syntactical and text in entity descriptions and also their semantic structure in the ontology representations. This process, illustrated in the block diagram shown in Figure 1, is divided into two main sub-tasks: Alignment and SKOS translation. The inputs are two ontologies and result of the process is an SKOS-based ontology that contains automatically defined associations. The alignment task analyses lexical and structural attributes of ontologies to automatically produce associations between concepts. The relation is defined: $\mathcal{R}(\mathcal{A}, \mathcal{B}) = \langle \mathcal{A}, \mathcal{B}, Relation, \mathcal{S}(A, B) \rangle$ where \mathcal{A} and \mathcal{B} are ontology concepts, $Relation$ describe semantic relations between these concepts which have five types: equal, beIncluded, include, disjoint, related, and $\mathcal{S}(A, B)$ is similarity measure for two concepts based on their structure and lexical analysis.

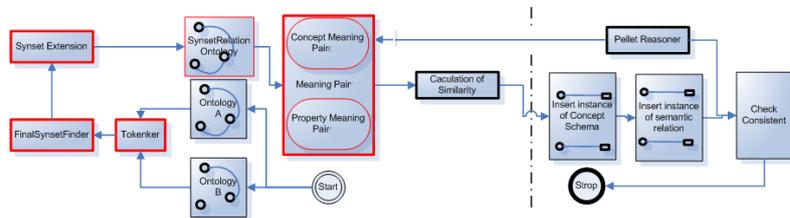


Fig. 1. The ontology alignment process

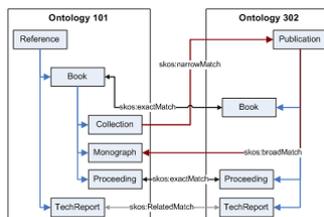


Fig. 2. Snapshot of the specified properties in the integrated ontology

Defining SKOS-based Associations. After identifying possible relations between concepts, they are imported based on the SKOS model. This will provide an interconnection between two ontologies based on standard set of properties defined in the SKOS model. The SKOS mapping properties include *skos:closeMatch*, *skos:exactMatch*, *skos:broadMatch*, *skos:narrowMatch* and *skos:relatedMatch*. The properties maintain a mapping between SKOS concepts adapted from schemes. The relations in concept pairs defined in the previous section are based on *synset* relations in WordNet. They are obtained according to accessing the extended *synset* collection for each representative word that describes entities and calculating structural similarity. We will map between *synset* and SKOS relations. By applying these mappings, the final product of the ontology integration process will include assertion axioms in which the related concepts from different ontologies are linked to each other based on SKOS relations. The integrated ontology will be a collection of concepts and properties from both ontologies and will also include the SKOS association properties. Figure 2 illustrates a part of the SKOS relations and concept alignment between two ontologies from the dataset (a complete set of our evaluation results using OAEI2008 dataset can be accessed from: <http://tinyurl.com/38veolh>).

Acknowledgement. The work is partially supported by the *m:Ciudad* project funded by the European 7th Framework Programme, contract number: 215007. Xiulei Liu’s and Jianxin Liao’s research is supported by Chinese National Science Fund for Distinguished Young Scholars (No. 60525110) and Chinese National 973 Program (No. 2007CB307100, 2007CB307103).

References

1. T. L. Bach, J. D. Bo, and R. Lara, “Knowledgeweb consortium, state of the art on ontology (d2.2.3),” 2004.
2. P. Shvaiko and J. Euzenat, “A survey of schema-based matching approaches,” in *J. Data Semantics IV*, 2005, pp. 146–171.
3. Y. Kalfoglou and M. Schorlemmer, “Ontology mapping: The state of the art,” 2003.
4. A. Miles and S. Bechhofer, “(editors) skos simple knowledge organization system reference, w3c recommendation 18 august 2009.” [Online]. Available: <http://www.w3.org/TR/skos-reference/>