An Ontology Mapping Method Based on Support Vector Machine

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Abstract. Ontology mapping has been applied widely in the field of semantic web. In this paper a new algorithm of ontology mapping were achieved. First, the new algorithms of calculating four individual similarities (concept name, property, instance and structure) between two concepts were mentioned. Secondly, the similarity vectors consisting of four weighted individual similarities were built, and the weights are the linear function of *harmony* and *reliability*, and the linear function can measure the importance of individual similarities. Here, each of ontology concept pairs was represented by a similarity vector. Lastly, Support Vector Machine (SVM) was used to accomplish mapping discovery by training the similarity vectors. Experimental results showed that, in our method, *precision*, *recall* and *f-measure* of ontology mapping discovery reached 95%, 93.5% and 94.24%, respectively. Our method outperformed other existing methods.

Introduction: In this paper, our study mainly is to discover the mapping[1] between concepts belonging to the different ontologies respectively. The proposed algorithm about ontology mapping in this paper mainly focuses on the following two points:

1. Using new methods of calculating individual similarities (concept name, property, instance and structure).
2. Proposing the methods of similarity aggregation using SVM to classify the similarity vectors which reflect the similarities of concept pairs. Here, the elements of a similarity vector consist of the weighted individual similarities, and the weight of an individual similarity is the linear function of *harmony*[2] and *reliability*[3].

To evaluate the method proposed in this paper, we used the benchmark tests in OAEI ontology matching campaign 2012 as data sets, and got precision, recall and f-measure of the different ontology mapping algorithms by experiment.

The algorithms of ontology mapping: The process from calculating similarities to discovering ontology mapping is shown as Fig.1. In Fig.1, O_1, O_2 are two ontologies. Firstly, four individual similarities were computed; secondly, the similarity vectors consisting of four weighted individual similarities were built, and the weights were decided by both of harmony and reliability. Here, each of concept pairs between two ontologies was represented by a similarity vector; lastly, SVM was used to accomplish mapping discovery by classifying the similarity vectors.

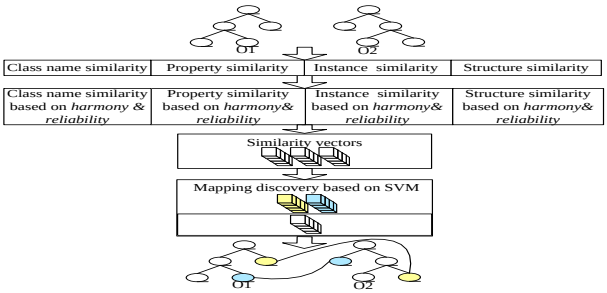

Fig.1. Process of ontology mapping

Experiment Design: Ontology mapping methods related to similarity calculation have been discussed in many studies, and *precision*, *recall* and *f-measure* are usually used to evaluate mapping results. Experimental steps are as follows:

(1) For all ontological concept pairs, the four individual similarities would be calculated; (2)These similarities would be aggregated and mappings between ontologies would be extracted by using 11 methods such as "*Neural network*", "*Sigmoid*", "*Harmony*", "*Reliability*" and so on;(3) For our approach, after four individual similarities and their respective harmony and reliability were worked out, similarity vectors consisting of our weighted individual similarities would be built, and the weights are the linear function of harmony and reliability, and ontology mappings would be extracted by SVM;(4)For all ontology pairs, precision, recall and f-measure of ontology mapping discovery would be calculated in every methods.

Result: Precision, recall and f-measure in our approach reach 0.95,0.935 and 0.9424, respectively, and are the highest, which can validate that the results of mapping discovery are more accurate after harmony and reliability is joined into SVM, and also can show that our approach outperforms than others dramatically.

Conclusions: This study is an effective approach to resolve the problem about ontology mapping in the Semantic Web. Future work will focus on studying the mapping algorithms between uncertain ontologies.

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