Towards Matching of Domain Ontologies to Cross-Domain Ontology: Evaluation Perspective

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1 Introduction

Ontology matching, as a process of matching two or more ontologies, is usually aimed at matching of domain ontologies. However, there are also other kinds of ontologies which make sense to align (and particularly with domain ontologies). Cross-domain (general) ontologies cover more domains. For example, the *DBpedia ontology* is a cross-domain ontology. It contains concepts, such as *Agent*, *Device*, *Food*, *Place*, from diverse domains. In comparison, domain ontologies focus on concepts from one area. For instance, the *confof* ontology from OntoFarm[1] contains concepts such as *Contribution*, *Event*, *Person* dealing with the conference organization.

While motivation use cases (such as *information integration* and *information sharing*, e.g. in [1]) for matching of domain ontologies to a cross-domain ontology are to a large degree similar as for matching of domain ontologies, there are different challenges with regard to matching. We claim that matching to cross-domain ontology is more difficult for traditional ontology matching systems since a cross-domain ontology contains concepts from various areas and it is more difficult to recognize proper concepts to align. Next a cross-domain ontology is usually larger. In all, we can expect a higher amount of false positives (lowering precision) since string-based matching techniques will be more often confused. There has not yet been much work done on this kind of matching. Authors in [3] focused on matching enhanced with knowledge of the domain and they evaluated their approach on matching two domain ontologies to the DBpedia ontology. Further there is a close effort of matching of foundational ontologies [2].

2 Reference Alignment and Evaluation

For building of reference alignments (RA) we merely focused on entities of *DBpedia* ontology [2] from DBpedia namespace and three ontologies from OntoFarm:

[1] https://owl.vse.cz/ontofarm/

[2] http://downloads.dbpedia.org/2016-10/dbpedia_2016-10.owl

confof, *ekaw*, *sigkdd*. The process of constructing RA was supported by basic ontology matching techniques available from the Alignment API.[3] Further, a thorough manual matching was applied. Based on these input a tentative RA were prepared.[4] Finally, the RA were reconciled with the existing RA for the conference track of OAEI (Ontology Alignment Evaluation Initiative)[5] consisting of correspondences between OntoFarm domain ontologies. The resulted RA contain both equivalence and subsumption correspondences with 1:1 cardinality.[6]

For evaluation (merely equivalence correspondences) we employed several matching systems from OAEI 2019: *AML*, *DOME*, *LogMap* and *LogMapLt*.[7] According to the results in Table 1 AML, DOME and LogMap have very similar results in terms of F_1-measure. While LogMap is better in precision, AML and DOME are better in recall. The system based only on string technique, LogMapLt, has the lowest F_1-measure. As expected evaluation metrics are rather low (e.g. 0.42 vs. 0.70 in terms of comparing F_1-measures with regard to the result of matching of domain ontologies in the conference track of OAEI 2019).

Table 1. Precision, F_1-measure and Recall for systems (micro-average).

System	Prec.	F_1-m.	Rec.
AML	0.30	**0.42**	0.67
DOME	0.32	**0.42**	0.60
LogMap	0.37	0.41	0.47
LogMapLt	0.33	0.36	0.40

3 Conclusions and Future Work

Low scores of measures show that the corresponding test cases are difficult for traditional ontology matching systems since they mainly focus on matching of domain ontologies. In future we plan to engage more systems and we also plan to extend the RA. We envisage to employ the RA within the conference track of the OAEI 2020 as a new challenge for matching systems.

Ondřej Zamazal is supported by the CSF grant no. 18-23964S.

References

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[3] `http://alignapi.gforge.inria.fr/`
[4] RA were done by one evaluator and eventually one referee confirmed the resulted RA during a discussion.
[5] `http://oaei.ontologymatching.org/`
[6] Available on the OntoFarm web, `https://owl.vse.cz/ontofarm/#ra-to-dbpedia`.
[7] System papers are available at `http://om2019.ontologymatching.org/#ap`