Paving a Research Roadmap on Network of Ontologies[1]

Fábio Santos, Kate Revoredo and Fernanda Baião

Department of Applied Informatics, Federal University of the State of Rio de Janeiro, Brazil
{fabiomarcos.santos,katerevoredo,fernanda.baiao}@uniriotec.br

Abstract. Network of ontologies is the pairwise match of a set of ontologies, which became recently relevant due to its applicability in different domains, such as cultural evolution. However, the challenges faced in this area are not completely known and understood, neither are their relations to ontology matching counterpart problems. The goal of this paper is to identify challenges and applications of a network of ontologies and compare them to the 8 existing challenges of ontology matching. We identified four new challenges and related them with the eight challenges presented in [3].

Keywords: Ontology, Ontology Alignment, Network of Ontologies, Systematic Mapping Study.

1 Introducing research challenges on Network of Ontologies

After years of research and work on the Ontology field, different ontologies for describing the same domain of discourse were developed, either from scratch or based on existing ones. To deal with a number of distinct ontologies for the same domain, various Ontology matching systems were developed towards improving the process of aligning ontologies in a pair wise manner. The field of Ontology Matching evolved significantly; yet, some challenges still remain, as highlighted in [3].

With the advances on matching techniques, a network structure naturally arose, composed by the set of discovered alignments and their respective ontologies. The network environment brings new tasks that were not necessary when we were dealing with single or pairs of ontologies. So to explore the network of ontologies issues, and try to understand the relation with the matching problems, we performed a systematic mapping study and compared the challenges we have found with the challenges presented in [3]. The complete study and its results are detailed in [5].

Network of Ontologies (N.O.) is a set of ontologies with a set of alignments between them [1], or a set of theories linked by different kind of relations [2]. At some point, an application may look for alignments options in a network or a network has to be maintained with supporting tools.

We investigated, through a systematic mapping study, a research question of "*How similar is the N.O. alignment task when compared to the ontology matching*"? We have identified four challenges: network consistency detection, network revision and repair, network creation and management and inter-network matching. The first two

1 This research is partially funded by CNPq and CAPES Brazilian agencies, grant number 401505/2014-6

were mentioned in the articles selected and the last two were inferred by the N.O. definitions presented in some articles.

Figueroa *et al.* [4] presented a methodology to build ontologies and a tool to manage lifecycles. However, the approach does not address the definition of activities related to N.O. administration including user access and rights, node management, network troubleshooting and other typical activities in network environments. These problems were also not covered in [3]. If we relate the known research areas in [3] to the four "new" challenges we found after this systematic mapping, as illustrated in Figure 1, we may reveal some characteristics of the challenges.

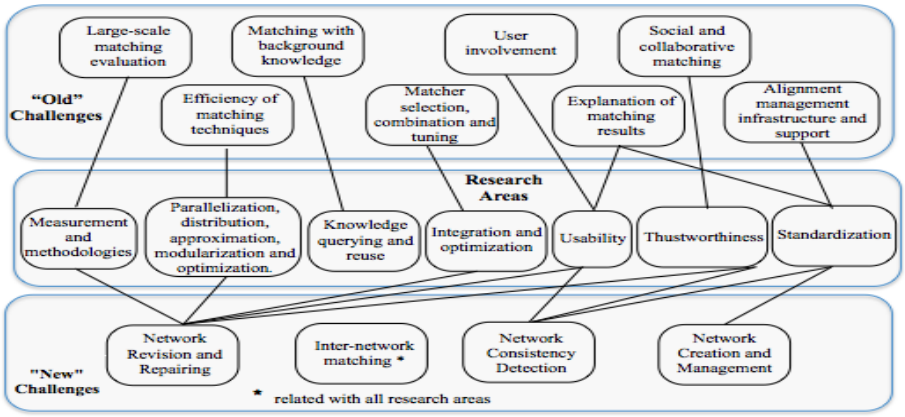

Fig. 1. Ontology Matching and N.O. challenges, and inter-related research areas

2 Final Considerations

This work provides a first roadmap for research on Network of Ontologies, by pointing a set of challenges found through the use of a systematic mapping in the literature. Interestingly, the identified challenges interrelate to previous Ontology Matching challenges posed in [3] by addressing overlapping research areas. Moreover, the new challenges found also transcend previous one with regard to specific issues such as consistency detection and alignment repair.

References

1. Euzenat, J. "Networks of ontologies and alignments." SWXO Lecture Notes (2011)
2. Euzenat, J. "Revision in networks of ontologies" Artificial intelligence 228,195-216 (2015)
3. Shvaiko, P., Euzenat, J. "Ontology matching: state of the art and future challenges." IEEE Transactions on knowledge and data engineering 25.1 pp. 158-176 (2013)
4. Suárez-Figueroa, M. C., Gómez-Pérez, A., Motta, E., & Gangemi, A., "Ontology engineering in a networked world". Springer Science & Business Media, (2012)
5. Santos, F., Revoredo, K., Baião, F., Network of Ontologies – A Systematic Mapping Study and Challenges Comparison, Technical Report. Relate-DIA/UNIRIO, RT-0005/2017, 2017. Available at http://www.seer.unirio.br/index.php/monografiasppgi/article/view/6833