Ontology testing framework through requirements formalization

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1 INTRODUCTION

An *ontology* is defined as "a formal, explicit specification of a shared conceptualization" [4]. Due to the fact that an ontology is shared, it needs to be agreed by a community of users, developers and domain experts.

The increasing uptake of the Semantic Web has marked an important step in the evolution of ontologies. They represent a way for a shared knowledge conceptualization and to formally represent real world domains, and as a consequence of that, they play an important role in both data and application interoperability. In this sense, the ontology requirements [1], which gather all the community interests to be able to identify the knowledge the ontology needs to represent, are essential to generate complete ontologies and to generate conceptualizations that represent the expected world domain. The ontology engineering discipline is in charge of providing methodologies, tools and languages to develop these ontologies and to guarantee that the generated ontologies are of quality. The majority of ontology development methodologies take into account this importance of ontology requirements. However, they do not take into account the validation of these requirements as an independent activity during the ontology development process.

2 STATE OF THE ART

There are testing approaches which defend the importance of the verification of the ontology regarding its ontological requirements. Vrandevcic and Gangemi [5] and Keet and Lawrynowicz [2] proposed different types of tests to verify the ontology. Ren et al. [3] propose natural language processing to analyse the requirements and automatically obtain types of SPARQL queries to test the ontology. However, these approaches are limited to proposing types of tests, and they do not considered how to implement them or how to integrate them into the development process.

3 METHODOLOGY

In this work we focus on ontology testing as a process needed by ontology engineers to verify and validate ontology requirements by generating tests from them. This process is divided into three activities, i.e., test design, test implementation and test execution, and covers the entire workflow from the requirements identification until the requirements validation. The main idea of the work is to formalize the ontology requirements, which are written in natural language, into a set of SPARQL queries and OWL axioms based on the expected knowledge each ontology requirement wants to cause in the ontology. This formalization avoids the ambiguity inherent to the natural language and also allows to have executable requirements. Moreover, the tests are stored in RDF using the test description vocabulary.[1]

During the test design activity, the tests are designed by using a collection of test expressions provided by the testing framework. In the test implementation activity the implementations for each one of the test expressions are generated, which are executed on an ontology during the test execution activity. The division of the test design and the test implementation allows the reuse the tests over different ontologies, due to the fact that the implementation is automatically generated depending on each ontology.

4 CONCLUSIONS

We expect that adopting ontology testing as an activity in ontology development will improve the quality of ontologies regarding its completeness.

Furthermore, we think that having a testing framework which provides methodological and technological support could motivate the creation of standardized representations of tests in ontology engineering. Finally, these testing framework can be used concerning other goals rather than only for ontology verification, such as conformance between ontologies or regression testing.

This testing process was integrated into the H2020 project *VICINITY: Open virtual neighbourhood network to connect intelligent buildings and smart objects* in order to verify that the ontologies covers all the requirements asked by the users and domain experts [2].

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[1] https://w3id.org/def/verification-tests#
[2] http://vicinity.iot.linkeddata.es/vicinity/index.html