Reusing Domain Ontologies as a Whole

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Motivation

Building ontologies from scratch is resource consuming. The reuse of domain ontologies reduces time and costs in the development process, spreads good practices when well-developed ontologies are reused, and increases the overall quality of ontological models.

What is Reusing Domain Ontologies as a Whole?

Domain Ontology Reuse

Definition

Domain Ontology Reuse refers to the process of using domain ontologies in the solution of different problems

Goal

The goal of this process is to find and select one or several domain ontologies related to the domain of the ontology being developed in order to be used in such ontology in development

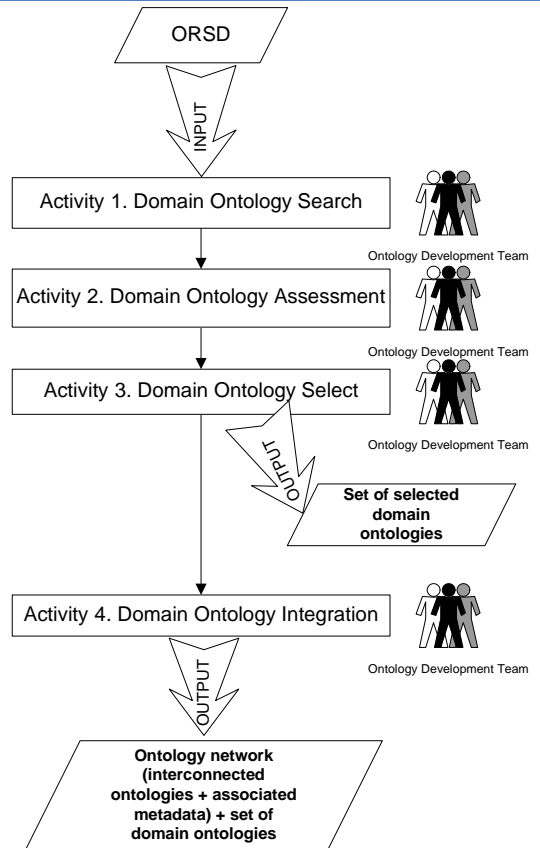| *Input*	*Output*
The OSRD	Ontology network extended with the reused domain ontology

Who

Software developers and ontology practitioners

When

The domain ontology reuse process should be carried out after the ontology specification activity

What is the process?

ORSD

INPUT

Activity 1. Domain Ontology Search — Ontology Development Team

Activity 2. Domain Ontology Assessment — Ontology Development Team

Activity 3. Domain Ontology Select — Ontology Development Team

OUTPUT → **Set of selected domain ontologies**

Activity 4. Domain Ontology Integration — Ontology Development Team

OUTPUT → **Ontology network (interconnected ontologies + associated metadata) + set of domain ontologies**

The process in detail (1)

Activity 1. Domain Ontology Search.

The objective of this activity is to search in libraries, repositories and registries for candidate domain ontologies that could satisfy the needs of the ontology network being developed. The ontology development team carries out this activity taking as input the ORSD, concretely those terms that have a high frequency in the ORSD, and using tools such as Watson, Oyster, Swoogle, etc.

The activity output is a set of candidate domain ontologies that could be implemented in different languages.

Activity 2. Domain Ontology Assessment.

The objective of this activity is to find out if the set of candidate domain ontologies are useful for the development of the ontology network. The ontology development team carries out this activity taking as input the set of domain ontologies obtained in activity 1, using for deciding if a particular domain ontology is useful or not the following criteria:

- Check if the scope and purpose established in the ORSD are similar to those of the candidate domain ontologies.
- Check the functional ontology requirements established in the ORSD. Examples of requirements can be the language for implementing the ontology (syntactic level), terms to be used in the ontology must be taken from standards, multilinguality must be represented in the ontology to be developed, etc.
- Check the CQs included in the ORSD with respect to the candidate domain ontologies, taking into account the terminological and semantic levels.

The process in detail (2)

Activity 2. Domain Ontology Assessment. (continues)

- Terminological Level: the ontology development team calculates the precision and recall of the candidate domain ontologies with respect to the terminology included in CQs.
- Semantic Level: the ontology development team checks if the candidate domain ontologies are able to answer the CQs included in the ORSD.

The activity output is an assessment table that analyses each candidate domain ontology with respect to the aforementioned criteria. For deciding that a domain ontology is useful, the set of criteria related with the ontology requirements and CQs has to be satisfied. Useful domain ontologies are shadowed in the table.

Activity 3. Domain Ontology Select.

The objective of this activity is to find out which domain ontologies are the most suitable for the development of the ontology network. The ontology development team carries out this activity taking as input the useful domain ontologies from the assessment table obtained in activity 2, using for selecting the most suitable domain ontologies the following criteria:

- Ontological Resource Understandability: to check if the domain ontology has accurate documentation.
- Ontological Resource Modularization Effort: to check if the domain ontology is well modularized.
- Ontological Resource Integration Effort: to check if the estimation effort for integrating the domain ontology is low, and if the domain ontology uses naming conventions.
- Ontological Resource Reliability: to check if the domain ontology is reused by others ontologies or other ontology-based projects, and if the ontology has been evaluated. Then the ontologies that satisfy the larger number of criteria are selected in the selection table by means of shadowed columns. The activity output is a set of domain ontologies selected from the selection table.

Activity 4. Domain Ontology Integration.

The objective of this activity is to integrate the domain ontologies selected in the ontology network being developed. The ontology development team carries out this activity taking as input the set of domain ontologies selected in the selection table obtained in activity 3. For each domain ontology included in the input set, the ontology development team decides one of the following three modes for integrating:

- The selected domain ontology is reused as they are. The ontology development team integrates the domain ontology in the ontology network being developed.
- The selected domain ontology is reused with significant changes (e.g., use the domain ontology in a different implementation language). In this case, the ontological resource reengineering activity should be carried out with the domain ontology selected. Thus, scenario 4 (Chapter 3) should be followed.
- Several ontologies in the same domain are merged to obtain a new domain ontology. In this case, scenario 5 or scenario 6 (Chapter 3) should be followed.

Before reusing the domain ontologies selected by following any reuse mode, it is also convenient to evaluate the domain ontologies through the ontology evaluation activity (Chapter 14).

The activity output is an ontology network that includes the set of selected domain ontologies.