

ONTOLOGYJAM

A Toll for Ontology Reuse

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Abstract: There has been notable growth in the use of ontologies in knowledge management. This occurs because, with the use of ontologies, knowledge is shared and reused efficiently and clearly among all the resources, such as a person or an application. However, for the ontologies to establish confidence within an extremely competitive and flexible market, they must be created in a way that is swift and has high credibility, portability and scalability. However, there is a noted lack of tools to aid knowledge specialists in the activities of construction of a new ontology. For this purpose, this article presents a tool that enables the performance of concept research in the knowledge entities represented in an ontology, through the import of multiple ontologies. As a result, knowledge can be exported into a brand new ontology. Thus, based on the knowledge reuse, with the aim of extending an ontology so as to make it adequate to its application.

1 INTRODUCTION

Methodologies for the construction of ontologies are approached in various studies and the fact that a standardized methodology does not exist contributes to this diversity. As an example, Methontology (Gomez-Pérez et al., 1997), On-To-Knowledge Methontology (OTKM) (Sure et al., 2001), by Uschold & King (Uschold and Gruninger, 1996), by Gruninger & Fox (Gruninger and Fox, 1995). The most of methodologies recommends that knowledge specialists perform research in other ontologies with the purpose of reuse the concepts that are in accordance with the domain researched. This avoids re-work and gives prioritizes the sharing of knowledge.

For OTKM (Sure et al., 2001), the “Viability Study” and the “Kickoff” are the phases during which the knowledge specialist should do research into other ontologies. In the first, the research is conducted to evaluate the feasibility of the ontology to be created. For the second, the specialist should evaluate other ontologies with the purpose of reuse concepts already defined for the creation of a list of concepts that make up the new ontology. These concepts are utilized in the “Refining” phase.

In the Methontology (Gomez-Pérez et al., 1997), “Specification” and “Integration” are phases in which the reuse of concepts should take place.

“Specification” can be compared to the “Kickoff” phase of OTKM. “Integration” is the phase that explicitly deals with the reuse of concepts; this occurs through a semantic and contextual analysis of concepts already defined in other ontologies in order to reuse them.

The activities of knowledge reuses results in a laborious activity for the specialist, currently this is done manually, that is, the ontology must be scanned and analysed concept by concept using tools such as Protégé, that are not specific to the activity. Thus, in many cases, this stage of the ontology construction is not concluded.

There are several techniques to reuse resources of ontology, for example, the ontology matching, they are based on semantic and syntactic analysis to identify similar concepts and properties. However, this processes do not produce reliable results, for example, when the knowledge specialist want include a new concept into your ontology, the matching is not recommended to do this, because the goal is include a new concept and no match a concept.

The aim of this project is build a tool to improve the activities of construction of ontologies. In order to provide the search for concepts and properties in several other ontologies for the purpose of build a new ontology. The chart below shows the life cycle for the development of each methodology, as well as

the phases in which OntologyJam can be used.

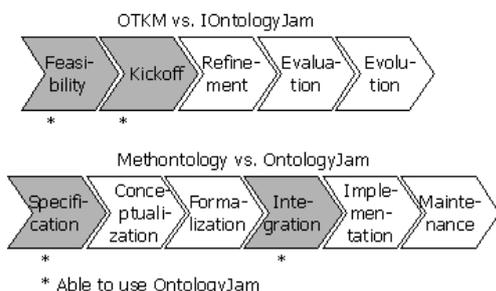


Figure 1: Phases of Methodology vs. OntologyJam.

2 ONTOLOGYJAM PROJECT

This chapter presents the methods applied to carry out the project.

2.1 Stages

A technical-theoretical approach is applied for carrying out the project, that is, in the first place, a theoretical basis was sought in regards to ontologies, OWL, Jena, Protégé, as well as a survey of requirements. Subsequently, development of the tool was initiated.

Firstly, the search information stage aims the understanding how the “tags” available in the OWL language manage the information contained in an ontology, and which methods and classes of Jena offers to manipulate this information. Protégé was used to aid in this stage.

The second stage was the prototype, considered the milestone, and first deliverable of the project, supported with a prototype presentation to those interested in the project. Its performance was evaluated for each functionality defined in the phase of surveying requirements. The improvements to the tool were also enumerated.

2.1.1 Development

The OntologyJam was built according to functionalities presented in Figure 2. As well, each screen of the system should be treated individually, however the set of them transforms the complete interface. For this to be possible, each screen was treated as an “Internal Frame”, when each frame is inserted into the work area of OntologyJam. This frames can be enables activated through the respective buttons, or links and they can be treated independently by the user.

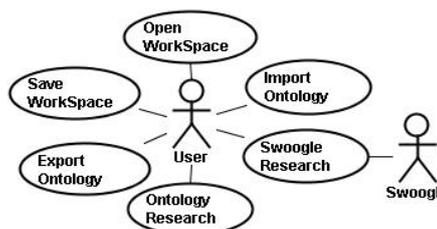


Figure 2: Use Case Diagram.

2.2 Tests

First of all, the tool was introduced to the certification team by presenting its functionalities, with the purpose of explaining the navigation between screens, how to import and how to create a new ontology. As well, the manual was delivered, containing a description of functionalities exemplified by the respective screens, the test cases and an evaluation questionnaire. The certification team was composed of four people and had two weeks to perform the tests and fill in the questionnaire. The questionnaire included open questions about each system functionality and about the set of conducted tests. The system could be evaluated in a scale that ranged from zero to five points. Two test cases were formulated, one for the usability test and the other for the functional test.

3 RESULTS

3.1 Analysis

In order to develop the software, the Java language was adopted, mainly because it offers portability and scalability, and also due to its integration with the Jena API. From the point of view of performance of the application, development in Java Swing was chosen for the interface, thus, processing occurs locally. In order to create the interface, framework JSR-296 was used.

OntologyJam supports ontologies in OWL language only. Therefore, for research in Swoogle a prior check is made as to the type of ontology, which is possible through the field “hasFiletype”, returned by Swoogle. Ontologies that are not in conformity with the reading standard for OntologyJam are informed to the user.

For the research functionality, a research method was used based on simple text comparisons, only differentiating between upper-case and lower-case letters, without taking into account the semantics of the terms.



Figure 3: Swoogle Search.

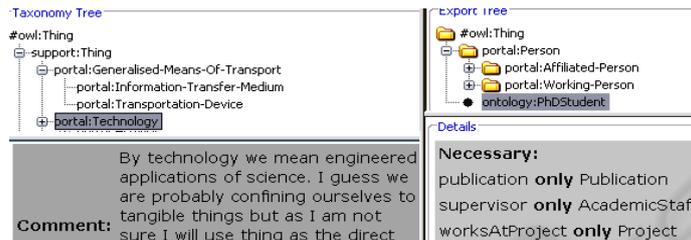


Figure 4: Export Screen.

3.1.1 Use Cases

The Use Case Import covers the import of ontologies in OWL that will serve as bases for the tool. There are two ways to this import, in order remote, that is, posted on the internet, by their URI address, or locally. These ontologies serve as basis to the search for concepts and properties.

The Use Case Ontology Research covers the research of entities in the ontologies given in the list of ontologies imported by the system. This functionality serves to specify the way in which the research will be conducted, which techniques will be used by the system, as well as the interaction with the user for the success of the research.

The Export functionality covers the export of the brand new ontology in order to reuse the concepts, properties and characteristics of the imported ontologies. Therefore, specifies the functionalities existing in the option to export the constructed ontology.

The Use Case Swoogle Research covers the research using the Swoogle ontology database, which, for its part, uses semantic techniques in its research. This functionality conducts research on terms, entities or keywords in multiple ontologies posted on the Swoogle database.

3.2 System Interface

OntologyJam was developed with an interface that is easy to understand, with links that aid in navigability between screens, which makes OntologyJam an agi-

le and user-friendly application.

The Swoogle research screen, presented in Figure 3, enables the user to conduct semantic research in ontologies using the Swoogle search mechanism, with the enormous advantage that, with one click, the user can import the desired ontology. However, one specific ontology can be import through the URI address, or located on the local Hard Disk.

The search allows the user to conduct research in the previously imported ontologies. The result is divided by ontologies, classes and properties in which the term was found. When a concept, property or ontology is selected, several details of the selected item are presented. Activating the option “Add to Favorites”, the concept is added to the folder “Favorite Classes”. This way, the user can select the main concepts that deems necessary.

The export screen, presented in Figure 4, the user can set up the taxonomic tree of the new ontology based on the taxonomic tree of the selected concept. From the export screen is possible select the options of this exportation, such as, insert a comment and label to new ontology, as well, exports the labels, the comments, disjoints, necessary, necessary & sufficient of classes, and ranges, comments, labels of properties in the export tree.

4 DISCUSSION

Several methodologies have been created with the purpose of aiding and standardizing the development

of ontologies. Each one has its techniques and principles. However, it should be noted that, no matter which methodology is adopted, knowledge specialists should always think about reuse concepts from other ontologies.

The evaluation of OntologyJam, made during its certification phase by final users has left important insights that will be considered for the future enhancements of the software tool, as they represent indicate improvements that the tool needs to perform its functionalities more appropriately.

In relation to functionalities, the search function was the one that had the lowest evaluation, which is due to the way in which the search is done. OntologyJam conducts the search based on the comparison of texts, with simple differentiation between higher and lower case letters, without taking into account the semantics of the terms, for example, radicals, synonyms and hyper-synonyms. Ideally, this search should be conducted using adequate algorithms. This way, the final result would be more explicit and efficient.

5 CONCLUSIONS

The development of this project was based on the reuse of the concepts already defined in other ontologies with the objective of aiding knowledge specialists in the first steps of creating an ontology. The result was the development of a tool that aids not only in reuse, but also in sharing, management and creation of a single meaning for knowledge.

OntologyJam was tested by people with knowledge of ontologies and together with the tests, it was proposed that a questionnaire be filled out with the purpose of obtaining an evaluation of all functionalities, the icons, the navigation and the results presented by the tool through a critical view of the users.

The results of the questionnaire were very positive, again exceeding expectations. Therefore, the conclusion that can be reached is that OntologyJam will be well accepted by the majority of users, as a useful everyday tool for knowledge specialists.

The main contribution of this project is a specific tool for reuse concepts from other ontologies; a need have not been attended to by IT yet. However, the conclusion of this project is far from meeting all the needs of the ontology creation process.

The experiences acquired during this project, new ways will be opened for the implementation of the new tools that can meet all the needs of

knowledge specialists. The integration of these tools based on existing methodologies will enable new domains of knowledge to be mapped in new ontologies in a much easier way.

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