# USING ONTOLOGIES FOR THE TEACHING OF TERMINOLOGY: THE CASE OF A PACKAGE TRAVEL ONTOLOGY

María Rosario Bautista Zambrana
*Universidad de Málaga (Spain)*

**ABSTRACT:** Ontologies play an important role nowadays in numerous fields: two of them are terminology and education. Based on that, this paper proposes to take a step forward and introduce ontologies in the teaching of terminology within the field of (foreign) languages for special purposes (LSPs). In this way, we will put forward a series of steps to teach specialised vocabulary related to package travel in a German class of the degree in Tourism, by exploring the use of some ontology browsers and editors.

**Keywords:** Ontologies, terminology, languages for special purposes.

## ONTOLOGIES IN TERMINOLOGY

Ontologies can be defined from two main perspectives: Philosophy and Knowledge Engineering, in turn branch of Artificial Intelligence. *Ontology*, in the first sense, is the "part of the metaphysics that deals with the being in general and with its transcendental properties," according to the *Diccionario de la Real Academia Española* (*Dictionary of the Royal Spanish Academy*).[1] In the field of Knowledge Engineering, where ontologies are a means to create knowledge-based systems — so that knowledge can be codified and processed by computer— Gruber's definition (1993: 199) is usually cited: "an explicit specification of a conceptualization." Weigand (1997: 138), for his part, offers a more specific definition: "an ontology is a database describing the concepts in the world or some domain, some of their properties, and how the concepts relate to each other."

Any ontology consists of a series of components. Corcho et al. (2005: 144-145) distinguish among concepts, relations, instances, constants, attributes, axioms, and rules:

[1] The definition in Spanish is: 'Parte de la metafísica que trata del ser en general y de sus propiedades trascendentales'.

- *Concepts* represent ideas about the physical or abstract objects that constitute a domain. As the authors point out, concepts are usually organised in taxonomies through which inheritance mechanisms can be applied. In this way, a class can be divided into subclasses that represent more specific concepts: for instance, in the domain we are dealing with, we can have the class "transport", which can further contain the subclass "ship".
- *Relations* represent a type of association between concepts of the domain. The majority of relations link two concepts, so they are called *binary relations*.
- *Instances* represent individuals or specific elements of an ontology. So, for instance, the concept "hotel" can be instantiated as "Four Seasons Hotel".
- *Constants* are numerical values that do not change during much time. For example, the minimum number of nights in a package travel is one.
- *Attributes* describe properties of concepts and of instances. The authors distinguish two types of attributes: *class attributes* and *instance attributes*. The former ones describe concepts and take their values in the concept where they are defined. The latter ones describe instances and take their values in them.
- *Formal axioms* are logical expressions that are always true and are normally used to specify constraints in the ontology.
- *Rules* are generally used to infer knowledge in the ontology, such as attribute values.

Figure 1 represents a simple ontology —also called *lightweight* ontology— containing classes, taxonomical relations, and ad hoc binary relations.

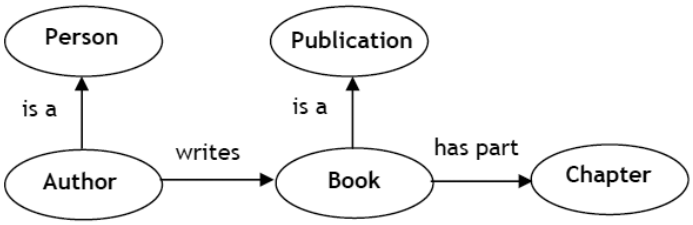


Figure 1. Simple ontology (Wilson, 2004: 2).

Ontologies can be built following diverse methodologies; it is also commonplace to use some kind of computer tool that helps in the process. On

the other hand, ontologies in their final form are formally expressed through ontology languages: the most common ones are OWL (Web Ontology Language) and RDF(S) (Resource Descriptive Frameworks), while some applications create their own XML format for ontologies.

Ontologies play an important role nowadays in numerous fields: Semantic Web, e-commerce, information retrieval, information extraction, indexing, and terminology. In this last respect, many authors and researchers have studied the link between terminology and ontologies: Moreno Ortiz (2000, 2008), Temmerman & Kerremans (2003), Vargas (2007), Aguado de Cea (2009), and Alcina (2009), to name just a few.

In this way, in relation to terminology, ontologies are considered as a valuable means to approach terminological work: the reason is that a substantial part of the terminologist's work needs a conceptual approach. As Vargas (2007) states, it is necessary to understand the area being explored in order to be able to structure it, classify it and define it; among other advantages, the conceptual structuring provided by ontologies allows:

- To determine the relevance of the terms in the domain; by dividing them into groups related to a certain subfield, it is possible to establish which ones are really interesting, based on the goals and the prototype user of the terminological application to be created (database, dictionary, vocabulary, etc.).
- To construct a more controlled and coherent terminology, given that structuring makes it possible to treat an area of specialty in a more systematic way.
- To define terminological units in a logical and systematic way.

Along this line of thought, Moreno Ortiz (2008) proposes the following definition for *ontology*: ontologies are conceptual and terminological descriptions of a shared understanding about a specific domain.

Moreover, given the close link between terminology and translation, some researchers have proposed to use the benefits of the ontological approach for multilingual dictionaries and, therefore, for translation (see, for example, Temmerman & Kerremans, 2003). In fact, a lexical resource based on ontologies could provide translators with the following information, among other data: a) the translation of a term; b) how that term is related to others from the same domain; and c) what properties and characteristics it has. An example is the *Dictionnaire Analytique de la Distribution* by Dancette & Rhétoré (2000).

On the other hand, ontologies can play an important role in the teaching/learning field:

> Ontologies have a range of potential benefits and applications in further and higher education, including the sharing of information across educational systems, providing frameworks for learning object reuse, and enabling intelligent and personalised student support. (Wilson, 2004: 1)

This paper is based on the previous ideas and proposes to take a step forward and introduce ontologies in the teaching of terminology within the field of (foreign) languages for special purposes (LSPs). We consider, as does Fernández Nistal (2009), that more emphasis should be placed on the cognitive competence of terminology students; and that, as Wilson (2004) states, ontologies can directly benefit learners by helping them to visualise and comprehend the relationships between concepts in their domain, as understood by more experienced practitioners. This can trigger "associative ways of processing, reflecting and analysing information" (Aroyo & Dicheva, 2002).

## ONTOLOGIES FOR LSP TEACHING

Taking into account the previous ideas, we propose to incorporate ontologies into the resources used to teach LSPs (Language for Specific Purposes): specifically terminology (specialised vocabulary) about package travel in German. In this way, the ontology becomes both a study and a reference tool, with which students can achieve a deeper understanding of the area being studied, as well as develop thinking skills that allow them to reflect on it, instead of just memorising a simple list of terms. Besides, as ontologies are computer-readable resources, this proposal will contribute to the use of Information and Communication Technologies (ICT) in class. The employment of ontologies will be combined with a number of exercises and activities which will help students in the process of learning a specialised language, and specifically, its terminology.

### Construction of the Ontology

Before presenting the whole process, we will introduce the ontology we will be using as a model and will explain briefly how it was built. The ontology covers a number of basic concepts from the package travel domain and is based

on the *Council Directive 90/314/EEC on package travel, package holidays and package tours*. It is of lightweight type, meaning that it is made up of concepts, concept taxonomies, ad hoc binary relations, and properties; it does not have axioms or rules. The methodology followed to build it was the METHONTOLOGY methodology (Gómez-Pérez, Fernández-López & Corcho, 2003), and the language used to lexicalise the concepts was German.

As part of METHONTOLOGY, we carried out a series of steps, each of which specifies a different element of the ontology: building a glossary of terms, building concept taxonomies, building a concept dictionary, and defining the following elements in detail: ad hoc binary relations, instance attributes, and class attributes.

After that, the ontology was formally implemented by means of the web application WebODE (Corcho et al., 2002). WebODE was created by the same research group that devised METHONTOLOGY, so it suits perfectly the methodology applied and the results obtained from it. We can see a screenshot of how a concept is inserted in Figure 2.

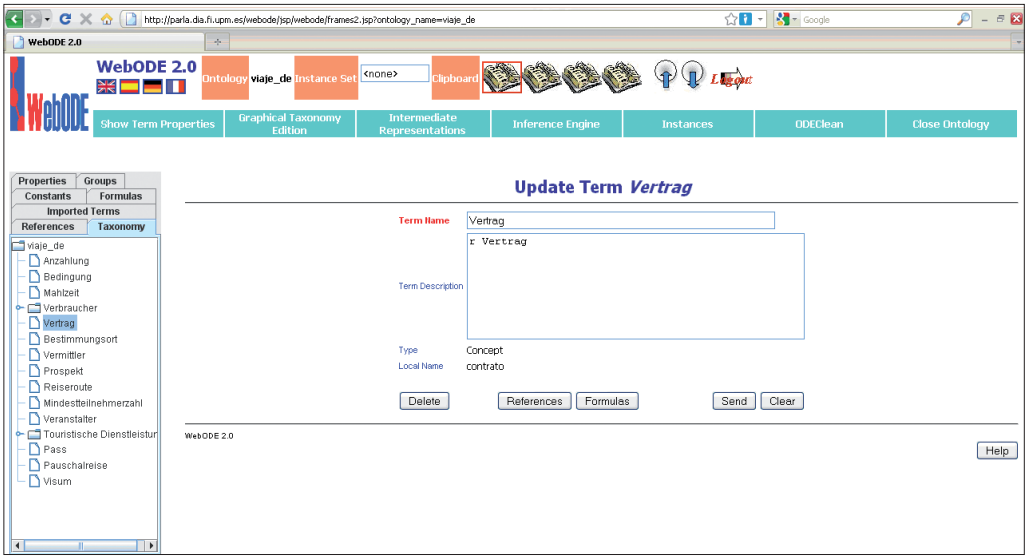


Figure 2. Introducing a concept in WebODE.

In this way, we created a lightweight ontology containing concepts, taxonomies, ad hoc relations between concepts and attributes, about the domain of package travel. The ontology is basic, in the sense that it contains only the most important terms of the field being studied.

## Using the Ontology in LSP Class

The ontology will become a resource to teach terminology in the context of a LSP class: specifically, it will be used to teach specialised vocabulary related to package travel in a German class of the degree in Tourism. Prior to the use of the ontology, the students will have read a contextualised text (or texts) containing the terms to be studied. Then the steps to take will be the following: a) explaining the basics of ontologies and conceptual structuring to students (concepts, relationships, properties, instances, etc.); b) teaching them how to use a straightforward ontology browser or editor (i.e., how to visualise the content of an ontology, how to search for information); c) presenting the concepts and terms of the domain to be studied through the different view options of an ontology browser or editor; and d) carrying out various activities on the basis of the concepts and terms stored in the ontology. We will next go into detail:

### *a) Explaining the Basics of Ontologies and Conceptual Structuring to Students*

The first step consists in teaching the students what an ontology is and what components it has (concepts, relations, properties, instances, etc.). Particular emphasis will be placed on the ideas of *semantic relationship* and *property*. Since the goal is mainly practical, the explanations and definitions will be kept as simple and clear as possible.

### *b) Teaching them how to use a simple Ontology Browser or Editor*

The next step consists in teaching them how to use a simple ontology browser or editor, that is, how to visualise the content of an ontology, how to search for information, etc. There are a number of tools that could be useful for this task: OwlViewer, OwlSight, Ontology Browser, SWOOP and WebODE.

OwlViewer[2] is a web application that allows to explore OWL ontology files, displaying the terms and relations between them. Besides, additional information (definition, author or comments) can be displayed when the mouse is over a

[2] http://bioinfoinb.cnb.csic.es/VisualOmics/OwlViewer/index_OV.html

node to help the user in the identification of terms. It also allows to search into the ontology tree expanding the desired term, or providing its name or identifier. The application is mainly graphical, so it could be useful for our needs. See Figure 3 for a sample view of the main screen.

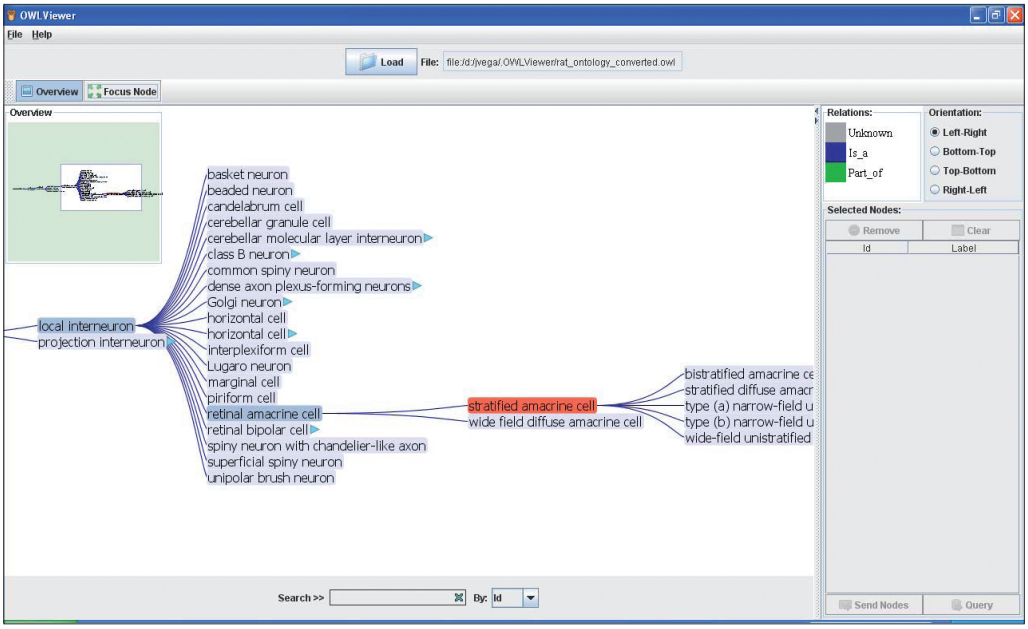


Figure 3. Sample view of the main screen of OwlViewer.

OwlSight[3] is a lightweight OWL ontology browser that allows to display the ontology in a graphical way. The user can choose to view the class tree, containing all the classes in the ontology and their respective taxonomies, or the property tree, which displays all the different attributes stored in the ontology. A click over a certain class reveals more information about it: lexicalisations, relations, properties, etc. Figure 4 shows our package travel ontology: in this case, the concepts are represented by nouns in Spanish, and clicking over any of them reveals the lexicalisation in German.

Ontology Browser[4] allows to navigate around ontologies created in OWL. The interface can display the list of all entities, of all classes or of all properties;

[3] http://pellet.owldl.com/owlsight/
[4] http://owl.cs.manchester.ac.uk/browser/manage/

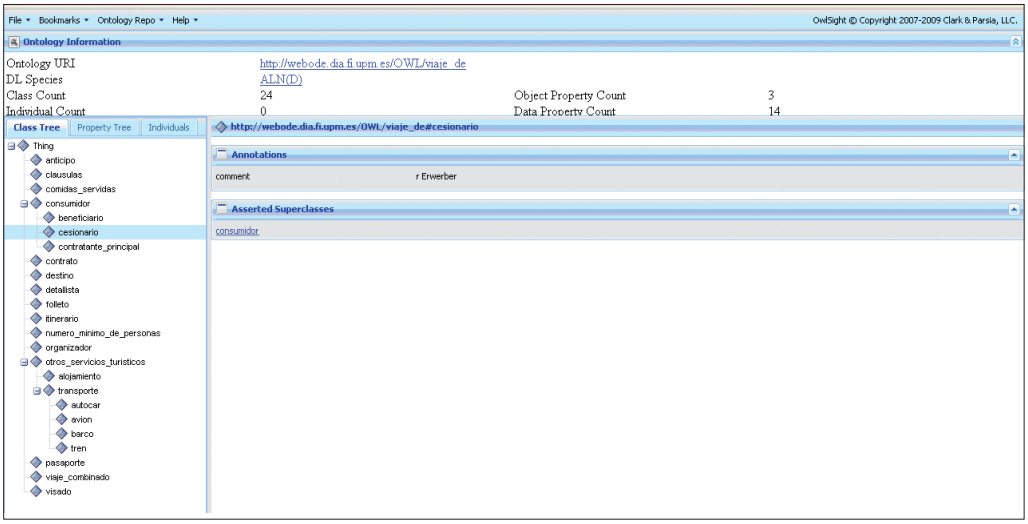


Figure 4. Package travel ontology displayed by OwlSight.

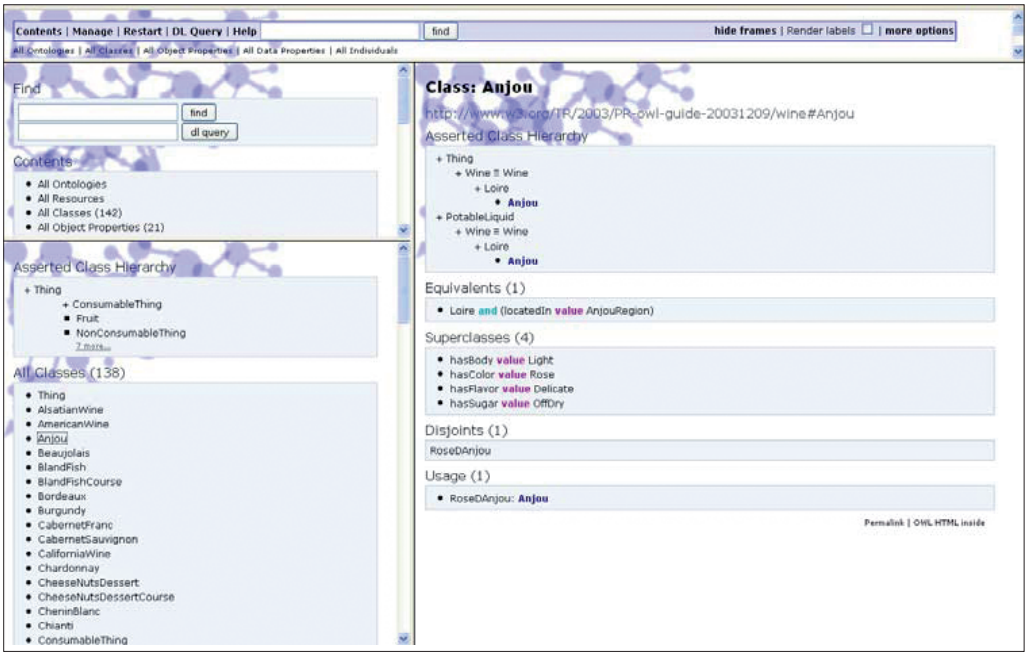


Figure 5. Wine ontology in Ontology Browser.

when a class is selected, the class hierarchy is shown, as well as the related properties and the other classes that are on the same level, that is, those that depend on the same superclass as the one selected. Other labels, for instance those for representing the lexicalisation of the concepts in other languages, are also shown. Figure 5 shows an example from a wine ontology, in which the class Anjou is displayed.

SWOOP[5] is an ontoloy editor which is meant for rapid and easy browsing and development of OWL ontologies. It has a web browser-like look and feel: hyperlink based navigation across ontological entities (address bar URL changes accordingly); history buttons (Back, Next, etc.) for traversal; and bookmarks that can be saved for later reference. These features, along with the simplicity of the application, justify why it could be useful for ontology-based terminology teaching. Figure 6 shows our ontology in SWOOP.

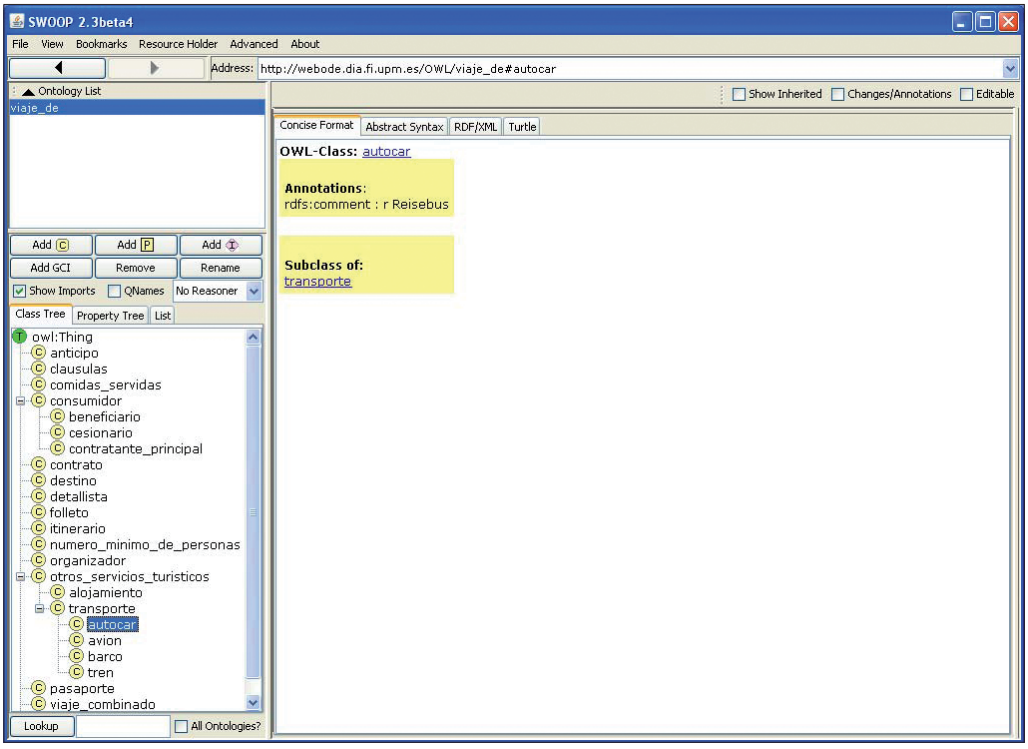


Figure 6. Package travel ontology in SWOOP.

[5] http://www.mindswap.org/2004/SWOOP/

WebODE,[6] as we said before, is a web application based on METHONTOLOGY. Although it is aimed at building ontologies, we can also use it as a browser, thanks to its form-based and graphical user interfaces. We will explore its possibilities in the next section.

### *c) Presenting the Concepts and Terms of the Domain to be Studied Through the Different View Pptions of an Ontology Browser or Editor*

WebODE offers several options regarding the visualisation of ontology components. On the one side, our package travel ontology can be viewed as a tree-like structure, where we can see all the classes that have been inserted, as well as its subclasses. When we click on a concept, we can see a description of it: in this case we have used that space to insert the gender of the corresponding term in German. We can observe an example in Figure 7.

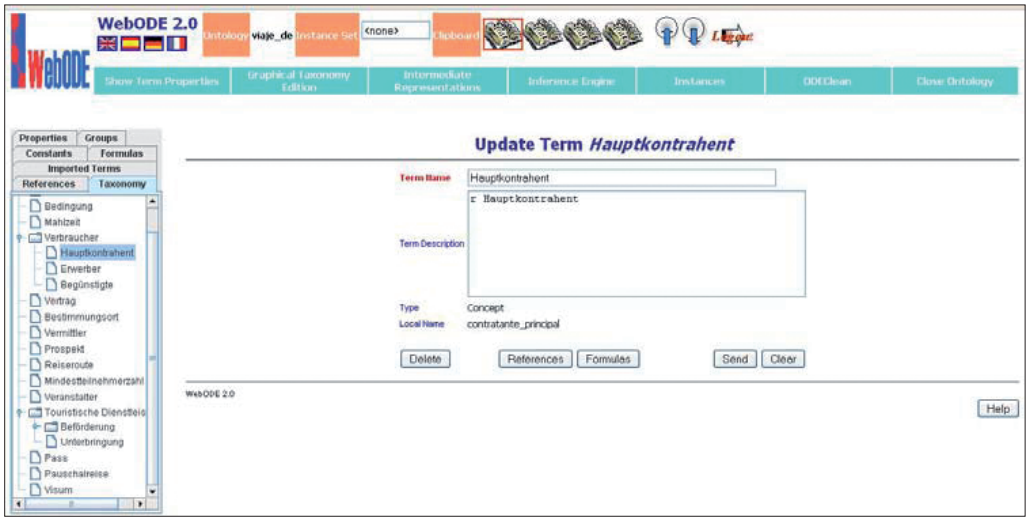


Figure 7. View of a concept in our package travel ontology.

Another possibility WebODE offers is to view the ontology through a graphical editor. This is a much more visual presentation which could help students to better remember the terms and relations to be learnt. As mentioned

[6] http://webode.dia.fi.upm.es/WebODEWeb/index.html

before, this can trigger associative ways of processing, reflecting and analysing information. Figure 8 shows a graphical view of our ontology.

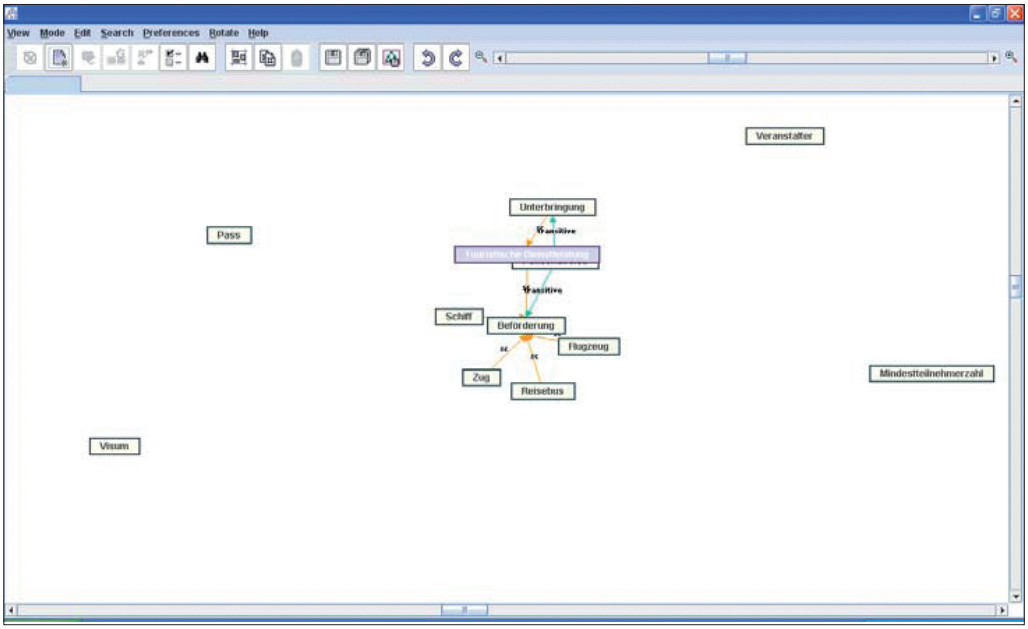


Figure 8. Graphical interface in WebODE.

### *d) Carrying out Various Activities on the Basis of the Concepts and Terms Stored in the Ontology*

We can reinforce the concepts and relations (hence, the terms) presented in class by doing a number of exercises containing those terms: gap-fill sentences, matching terms with definitions, grouping terms in categories (for example, "Group all the terms that represent tourist services", "Underline the terms that represent types of consumers", etc.).

In order to help students remember what they have learnt, they will be provided with print graphics and diagrams of the ontology (obtained from WebODE), tree-like lists of the terms, and a concept glossary containing the concepts, class attributes, instance attributes, and relations.

## CONCLUSIONS

Ontologies have proven to be a valuable resource in areas such as terminology and education. In this regard, we consider that they could be successfully used to teach terminology in a LSP class, so we have demonstrated how it could be carried out: among the numerous ontology browsers and editors that exist nowadays, there are several of them whose features and simplicity would be ideal for learning purposes. The proposal presented in this paper would complement other more traditional methods of teaching terminology, but we consider that this conceptual approach could considerably help students to learn new terms, in a more associative and reflective way.

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