Faceted browsing in repositories of learning objects

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This document contains a short summary about a research project done in the Unit of Virtual Teaching of the Educational Science Institute at University of Lleida (UdL). The study is based on using faceted browsers to organize a repository of learning objects.
The project, which is in an initial phase, consists of tagging materials that have been developed by the Unit of Virtual Teaching using some teaching material from university professors. We have used Learning Object Metadata (LOM) to describe the learning objects.
Moreover, we have applied a soft named Exhibit. It is a tool that allows us to create a faceted browser using elements of LOM data model as facets. Exhibit lets us import data from Google Docs (spreadsheet), so we can easily change data in the spreadsheet and the new data is represented in facets.
The aim of this project is to provide a semantic browser to search contents in our repository for the university community, especially teachers, so that they can find resources adapted to their specific needs.

Keywords LOM, faceted browser, semantic web

1. Context

This document offers information about a project we are doing at University of Lleida, precisely in a section named Virtual Teaching Unit. We are a multidisciplinary group. Part of us are computer professionals, and the rest of us psychopedagogues who work together to offer to the university community support on the use of information and communication technologies, innovation development, interactive multimedia materials creation, virtual campus comprehensive utilization and others technological tools, etc.

In the process of multimedia materials creation we have stored resources in a server. Teachers use this multimedia material in their subjects and after some years, our repository has grown notably, and we want to improve the searching process. Thus,we think it is important to perform this task. It must be useful and functional.

Although we think this project is important to Unit tasks, we are trying to go further: maybe we could do a public contents repository where people could enter and use the resources [1].

We consider resources like learning objects [2].They could be easy to retrieve, consult and use if teachers, in our case, consider them an interesting material to be showed in the Web.

To develop content repositories is not new idea, there are different reasons we can justify their use. There are economical issues: if you need some material, you can create it, on the other hand you can look for it around the world; perhaps someone has done the same content, and maybe you can reuse it in your formative process. Downes' explanation [3] is very clear, and we can think in this idea:

"The first assumption is that there are thousands of colleges and universities, each of which teaches, for example, a course in introductory trigonometry. Each such trigonometry course in each of these institutions describes, for example, the sine wave function. Moreover, because the properties of sine wave functions remain constant from institution to institution, we can assume that each institution's description of sine wave functions is more or less the same as other institutions'."

(…)

"Suppose that just one description of the sine wave function is produced. A high quality and fully interactive piece of learning material could be produced for, perhaps, $1,000. If 1,000 institutions share this one item, the cost is $1 per institution. But if each of a thousand institutions produces a similar item, then each institution must pay $1,000, with a resulting total expenditure of $1,000,000. For one lesson. In one course."

There are other reasons that we can consider to reuse materials [4]:

- •Flexibility: creating materials which can be reused in other contexts (tools) will facilitate an effective reuse, avoiding the change of the material to adapt in another context.
- •Personalization: creating reusable materials facilitate a personal and individual learning. The use of learning objects allows people to learn only that they need. In a course, the people must do the entire course but maybe they are only interested in one part.

- •Uniformity: the reuse guarantees the uniformity. For example, in one organization, maybe we teach the same information in different courses. This information can be the same learning object, and you avoid giving different information in each course.
- •Speed: creating reusable materials avoid starting to zero every time we have to create news contents.

When we thought about ordering the repository, the first option was to use keywords, but keywords can provoke some problems in a search [5]:

1. The precision in a search with keywords is low, because the search is based on the words, but it doesn't say anything about the meaning [6].
2. The search engines are not easy to use if you don't know the language of the search or if you don't know exactly what are you looking for.

One solution at the two problems is to do a search engine based in facets (View-Based Search).

2. View-Based Search

In a View-Based search the resources are associated to keywords. The difference between a normal search and another based on facets is that these keywords, to be called categories, on a view-based search can be selected from controlled vocabularies. Moreover the keywords are part of sections that are called facets or views (for instance Language, format or pedagogic use, could be examples of facets).

Hence, a view-based search consists on select the categories from the different facets that are available.

For instance, in a repository of learning objects we can define facets as difficulty, language or format.

Facets can be used for helping user in information retrieval in many ways. Among the improvements to the traditional keyword search can highlight two of them.

- The facets give the user an overview of what kind of information there is in the repository.
- The number of hits in every category that can be selected next can be computed beforehand and be shown to the user [7]. In this way, we avoid a search that returns an empty result set.

To develop a view-based search we have use Exhibit[8], a web application framework that allows us to create this type of searchers.

3. Exhibit

Exhibit is a web application framework written in JavaScript that allow us to create tools to search and browse using faceted browsing with a few knowledge of HTML. This software is inside SIMILE (Semantic Interoperability of Metadata and Information in unLike Environments) project. SIMILE* is focused on developing robust, open source tools that empower users to access, manage, visualize and reuse digital assets

One of the advantages Exhibit offers is the variety of formats that admits the application based in this software. Specifically in our project we pass data through a spreadsheet from GoogleDocs. In this way an extern user without any knowledge of computing can modify the document from any part of the world and immediately our application based on Exhibit will show the results.

In Fig 1 we can see a prototype of our view-based search that we have implemented. As it can be seen in the left part we have the different facets (Faculty (*Facultad),* Degree *(Titulación),* Language *(Idioma), Structure (Estructura)*) and in the right part we have the resources that fit to the selected categories. In this case we don't have selected any category, so we have all the available resources.

* http://simile.mit.edu/

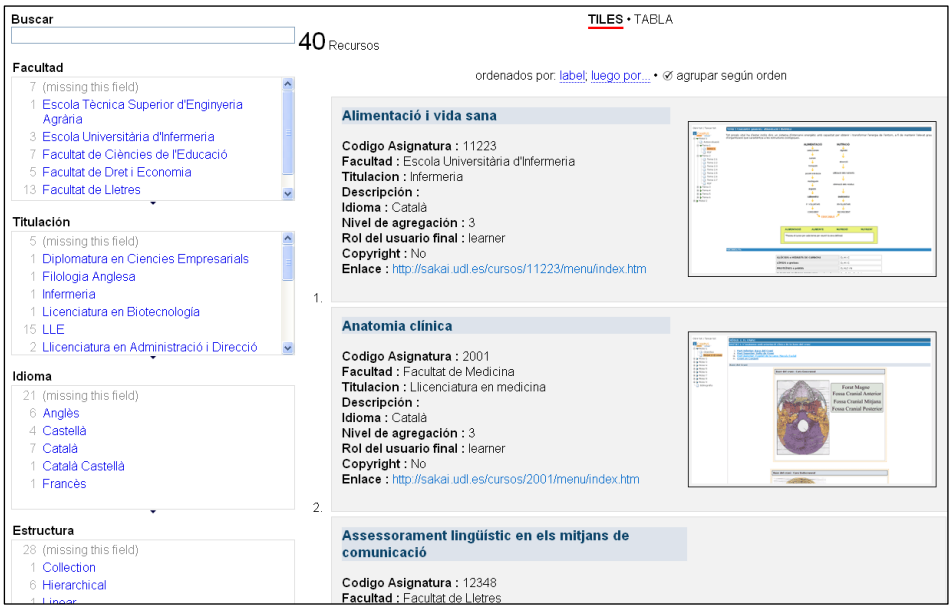

Fig. 1 First prototype based on Exhibit, in Spanish

Specifically to choose the facets we made a research of appropriate concepts from LOM, a data model usually encoded in XML. LOM allows us to describe learning objects and similar digital learning resources. With LOM we can define a set of properties to manage, place and evaluate learning objects. [9]

4. LOM

In LOM there are nine categories of different metadata [10]. Each category contains sub-elements; these sub-elements may be simple elements that hold data, or may themselves be aggregate elements, which contain further sub-elements.

In our project we made a selection of the LOM fields that best fits to our idea of facet. Specifically we selected 10 elements of LOM that will use as facets in our View-Based Search. These 10 elements are

- *Language*, *Structure*, *Aggregation Level*, *Format*, *Interactivity Type*, *Semantic Density*, *Intended End User Role*, *Typical Learning Time*, *Copyright*, *Difficulty*,

So to select all the resources in Spanish with a Linear structure and in PDF format we only have to select the appropriate categories from facets *Language*, *Structure* and *Format*.

5. Conclusions and future work

In this document we have explained the utility of the View-Based Search. We have exposed that a view-based search improves usability user and avoid empty results. As we have seen, Exhibit can help us to develop applications based in facets and with a few knowledge of HTML we can develop easily an application that interprets data from extern applications as Google Docs.

At the same time, also we have exposed some ideas to tag the learning objects using the metadata standard LOM, so we can use the categories of LOM as facets.

Thus, this project will try to be integrated in an OCW[†] web-based publication. Materials from OCW are used in almost all MIT[‡] courses; it may include syllabus, lecture notes, problem and answer sets, labs, reading and reading lists, videos, and special features among others. Users have permission to reuse, modify or redistribute OCW materials in terms of Creative Common Licenses. Nowadays, OCW contains more than 1800 courses. They are translated to Portuguese, Spanish, Persian, Chinese and Thai. This MIT project has educational partners from different disciplines as Chemistry, Physics, Mathematics or Mechanical Engineering. In our case, we are going to be integrated in Universia which is a consortium of more than 800 colleges in Spain, Portugal, and Latin America. The translated OCW courses are available in Spanish and in Portuguese.

[†] OCW – OpenCourseWare (http://ocw.mit.edu/OcwWeb/web/home/home/index.htm)
[‡] MIT – Massachussets Institute of Technology

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[10] http://www.cancore.ca/en/guidelines.html