# Leveraging social and semantic components in adaptive environments

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# Leveraging social and semantic components in adaptive environments[⋆]

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## 1 Abstract

In a Web 3.0 perspective, web sites and portals require design elements that make them executable environments (following W.L. Hoschs layering: read-only Web 1.0 - read-write Web 2.0 - read-write-execute Web 3.0[1]). A number of interface and software components have been implemented for providing such elements, with various appraisals with respect to their effectiveness in interaction and communication tasks, such as, e.g., navigation, retrieval, learning.

In this paper, I'll address an innovative element for the design and implementation of Web 3.0 executability in the context of a learning environment: a semantic layer for supporting tag annotation. We have applied these elements in the project 150 Digit, a web portal designed for (primary, middle, and high) school classes to virtually interact (also in a 3D environment) with the exhibitions that celebrate the 150th anniversary of Italy unity (http://www.150digit.it). In particular, I'll describe the ontology-based recommendation strategies for tags incorporated in 150 Digit and discuss the results of an evaluation carried out in a real setting. 150 Digit displays the exhibits and the related documents, such as the curators' notes, some learning objects created by the classes about the displayed items, multimedia presentations created by the teachers about 150th anniversary themes, etc. 150 Digit encourages the active participation of the users (students, teachers, other registered users) in tagging, voting, and commenting the exhibits and in creating, uploading, and tagging new contents. Tag recommendations support the active participation of the users helping the user to select relevant tags for both an exhibit and a newly uploaded material. Tag recommendations aim at introducing new connections over the site contents, and expanding the semantic categorization of the exhibitions from the categories provided by the curators to the semantics emerging from the users tags thus supporting from a 2.0 to a 3.0 perspective.

As shown by [2], semantic tools that exploit taxonomic knowledge already provide an external grounding for the relations among tags that emerge in a folksonomy, opening the way to the integration of these two sources of information. The semantic layer of 150 Digit consists of a categorization of the exhibits (also applied to user-contributed

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[1] http://www.britannica.com/blogs/2007/07/web-30-the-dreamer-of-the-vine/

content) through semantic labels that integrate the bottom-up, folksonomic representation of the site contents with their top-down, institutional categorization, thus making the curatorial knowledge available to the learning community and accessible through several exploration paths built upon the annotations of classes. In 150 Digit, the well-known vocabulary problem is addressed through an expansion along the meaning relations encoded in MultiWordnet, given the constraints provided by the semantic labels attached to the exhibits. The semantic component relies on a light ontology, the WordNet Domains [1], a taxonomy of domain labels originally developed to add semantic information to the meaning of terms in WordNet. While most ontologies require the expert knowledge to understand their structure (consider, for example, the foundational ontologies such as SUMO or DOLCE), the WordNet Domains lend themselves to non expert users, providing an off-the-shelf, portable layer on the top of which semantic recommendation tools can be easily built. The content recommender also follows this approach, by integrating social filtering techniques with the semantic knowledge encoded in tags.

During a few months, students and teachers have been visiting the largest (and permanent) exhibition (Fare gli italiani  Making Italians), and then attending a set of post hoc laboratories wherein they are required to interact with 150 Digit portal. These laboratories have constituted the basis for a thorough evaluation of the system with a two-fold goal: on the one side, to assess the advantage of Web 3.0 approach over Web 2.0 approach in recommendation, on the other, to assess its suitability for learning applications. During the lab sessions, the students were required to analyze the items related to the exhibits and to create and upload new materials, adding tags while doing both these operations; the students, randomly, either interacted with a modified version of the system - with the tag and content recommendation systems disabled - or with the regular one, thus receiving tag and content recommendations. In the talk, I'll present the results, evaluating the impact of our approach on the following aspects: the acceptance and the accuracy of recommended tags, the tagging activity of users, the quantity and the typology of the inserted tags, and the semantics they convey. The latter point implies an analysis of the collaborative content structure that emerges from the tag sets generated by the two versions of the system. This structure relies on MultiWordnet to capture the semantic relationship over tags and is compared with the semantic (MultiWordnet-based) relationship encoded into the system. In order to gain evidence for our approach, we also assess its benefits for the search function, by comparing the search results on the two sets of annotated data (with and without the semantic recommender).

## References

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