

ALOE - A Socially Aware Learning Resource and Metadata Hub

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Abstract. The changing nature of e-Learning, the Web, and its users that can be observed in the last years results in a need for new approaches and technologies to fully exploit the existing potential for learning with digital resources. Platforms that allow to share learning resources and metadata are intended to support the success of self-steered learning with potentially any kind of information that is available on the Web. The ALOE system, currently developed at DFKI, is an example for the realization of an according framework meeting the needs of open and flexible e-Learning solutions.

1 Motivation

With the evolution of the Web 2.0, collaborative systems such as flickr, YouTube and del.ici.ous that allow to share resources and information about them have been widely adopted. For the success of these applications two key factors can be identified: First, users of the systems do not require special skills in order to use them. Second, these systems offer their users direct benefit, e.g., the possibility to store information, and to access a great amount of classified, commented and rated resources. Such systems help to overcome the bottleneck of knowledge acquisition from which centralized approaches, where the description of resources is performed by one responsible institution, usually suffer.

The ALOE¹ system is a socially aware resource sharing tool particularly designed for learning content of arbitrary format. It follows Web 2.0 design principles [4], taking the changed behavior of today's users into account. These users capture information quickly from text as well as images, audio and video content but they also create and share their own resources. In the following, we present an overview of the requirements that have to be met to realize such a system, and the features as well as the general architecture of the ALOE system.

¹ <http://aloe-project.de/>

2 Sharing Learning Resources and Metadata

The requirements that have to be met when realizing a system to share digital resources and information about these resources involve asking the following key questions:

1. Which types of resources will be handled by the system, and how can the resources be integrated?
 - For potentially any kind of digital resource (e.g., HTML, PDF, podcasts, videos), and also for resources created by users themselves, integration possibilities have to be provided.
 - Integration should be possible by inserting the resources directly into the system or by referencing them via a URI.
2. How can resources be described properly to enable access and further functionalities?
 - Instead of centralised approaches, any attempt to describe resources should embrace diversity, i.e., take into account any information that is available about a resource. This also includes information provided by using social software (e.g., tags and ratings).
 - ‘Resource profiles’ instead of single metadata sets [1] can be used. A resource profile is defined as a ‘a multi-faceted, wide ranging description of a resource’. It is not compliant to a particular XML schema, instead, it is a patchwork of metadata formats (potentially created by different authors) assembled as needed in order to form a description that is most appropriate for the given resource. For the ALOE system, this means we should offer the possibility to annotate various descriptions for each resource.
 - Some mandatory metadata is required to *enable basic functionalities* such as search and display (containing, e.g., the name and location of a resource), about the *technical format of a resource and the technical requirements to use it*, and for *intellectual property rights* with information about the way in which a resource may be used.
3. How can users and other systems and applications interact with the system?
 - A system has to attract enough stakeholders that provide valuable information about resources, at best working as a self-sustained community.
 - ‘Harnessing of collective intelligence’ (see [3]) requires *diversity of opinion, independence, decentralization, and aggregation* (see [6]). To realize this, it is very important to provide a user interface following the principles of simplicity [2] and joy-of-use [5], and to encourage users to participate. Possibilities to import and export information should also exist. Last but not least, users should be offered the possibility to use functionalities in their usual contexts and applications, so that they can contribute with different views on resources.
 - An infrastructure allowing an easy creation of mash-ups and complex functionalities using the data provided from our system is required. Access to the data as well as the functionalities of the system may be provided by making use of Web services.

- The system should offer means of notification, e.g., about new resources concerning a certain topic, as well as the transmission of the new content itself. This can be realized by providing feeds using such formats as RSS or Atom.

3 The ALOE system

ALOE stands for Adaptable Learning Object Environment. The system is currently being developed in the project CoMet² at the Knowledge Management Department of DFKI. The aim of the project is the development of a system which offers possibilities to share learning resources and metadata about them, according to the requirements described in the last section. On the one hand, ALOE provides a rich user interface (see Figure 1) to motivate users to participate, on the other hand, data can also be exchanged via a Web service API. The information gathered in this way can then be used to realize advanced retrieval and personalization techniques.

In the current section, the functionalities of ALOE, and the general system architecture are presented.

3.1 Functionalities

ALOE provides support for multimedia resources of arbitrary types. It offers basic functionalities to contribute and search for resources, and visualizes information about resources that is available in the system.

Contribute: A resource can be registered in ALOE by uploading it as a file or by just using a reference to the resource, i.e., its URI. Besides the contribution of resources users of the system can upload user-defined metadata sets in order to further describe resources which are registered in the system.

Search: ALOE provides different search filters, e.g., a user can search for resources which contain certain keywords in their title, description or tags. Further an advanced search is provided that allows to search for keywords in defined metadata terms.

Display: The metadata which has been annotated for a resource is displayed together with a preview image of the resource.

Furthermore ALOE offers typical Social Software functionalities such as tagging, rating and commenting of resources by users of the system. The information provided by the users allows to browse content via tags (social browsing), and search results can be ranked according to different criteria, e.g., alphabetically, most viewed, best rated, etc.

As additional features, ALOE provides Atom feeds to notify users about new content, e.g., resources annotated with certain tags, as well as microformats for contact and event information.

² <http://www.dfki.uni-kl.de/comet>

The screenshot shows the ALOE website's home page. At the top, there is a navigation bar with the ALOE logo on the left and links for "Home", "My ALOE", "Learning Objects", and "Community". On the right side of the navigation bar, there are links for "Log In", "Register", and "Help", along with a search bar and buttons for "Learning Objects", "Groups", "Members", and "Advanced Search".

The main content area is divided into several sections:

- Welcome to ALOE:** A introductory message stating "Was ALOE bietet und was hier interessant ist. Motivation zum Registrieren. Eine Tour ..." with a "learn more..." link.
- What's New?:** A section for the latest news, dated "01.01.2007", with a "more news..." link.
- New Members:** A section showing profile pictures of new members: Anton, Lisa, and Maria, with a "more members..." link.
- Recently added Learning Objects:** A list of three objects:
 - Web 2.0 Principles and Best Practices:** "What does Web 2.0 mean for your company? Get the latest on the why, what, who, and how of Web 2.0 in this O'Reilly Radar Report." Tags: Web 2.0, O'Reilly, Report. Posted by Lisa on 2006-12-19.
 - GIMP - Tutorials:** "Beginner, intermediate, expert tutorials for GIMP." Tags: gimp, tutorial, graphics, howto, tutorials. Posted by Anton on 2006-12-19.
 - Paper Robot's Paper Robots!:** "The greatest instructions - Print, Punch, Cut, Glue, String, and Enjoy!" Tags: paper, robot, origami, toys, papercraft. Posted by Timo on 2006-12-19.
- Highest rated Learning Objects:** A section featuring the "Web 2.0 Principles and Best Practices" object.
- Popular Tags:** A list of popular tags including: ajax, blog, blogs, browser, cms, community, computer, CSS, daily, design, englisch, forum, germany, gesundheit, grafik, html, internet, javascript, lernen, linux, magazine, marketing, nachrichten, news, newspaper, online, photoshop, politik, pressearbeit, social, software, sport, suchmaschine, switzerland, tipps, tools, tutorial.

This screenshot shows a user's profile page on ALOE. The navigation bar is similar to the home page, but the "My ALOE" tab is active. A dropdown menu is open, showing options: "My Learning Objects", "My Learning Object Sets", "My Favorites", "Contribute a new Learning Object", "My Tags", "My Comments", "Recent Activity", "My Profile", "My Contacts", "My Groups", and "My Messages".

The main content area features a learning object titled "Freakonomics. Überras..." by Steven D. Levitt and Stephen J. Dubner. The object's cover image shows a green apple and a slice of orange. The description reads: "Lesenswertes Buch: Aha-Effekte garantiert! Die moderne Welt wird immer komplizierter. Und selten ist konventionelle wissenschaftliche Methodik geeignet, uns auf vernünftige Fragen praktische Antworten zu liefern. Steven Levitt, ein brillanter junger Professor der Wirtschaftswissenschaften, untersucht mit ökonomischen 'Werkzeugen' eine Vielzahl gesellschaftlicher Themen. In Zusammenarbeit mit dem Journalisten Stephen Dubner ist ein Buch entstanden, das zahlreiche Aha-Effekte garantiert, das uns manchmal schmunzeln lässt und stets über eindimensionales Denken hinausführt. So lassen sich viele scheinbar komplexe Probleme mit dem richtigen Schlüssel relativ einfach lösen. Hier werden Fragen aus verschiedensten Gebieten beantwortet. Fehleinschätzungen korrigiert und Verbindungen hergestellt, an die man oft nicht einmal ansatzweise denkt. Ein Buch voller spannender, unterhaltsamer und unerwarteter Geschichten, das zeigt, wie voreingenommen wir an vieles herangehen. Spielerisch werden die Ressourcen des Querdenkens aktiviert: Auf neue Ideen und kreative Lösungen kommen wir nur, wenn wir Probleme aus einer anderen als der gewohnten Perspektive betrachten."

On the right side, there are several interactive elements:

- Rating:** A star rating system (★★★★★) with a "Your Rating" section and instructions: "Put your mouse over the stars and then click."
- Tags:** A list of tags for the object: "Buch", "Freakonomics", "Kurioses", "Querdenken", "Wissenswertes", "German", "book". It also includes sorting options ("sort: alphabetically • by size") and view options ("view as: Cloud • List").
- Additional Information:** A section with statistics: "Viewed 22 times", "In 13 Favorite Lists", "This Learning Object is public", and "2 Comments".
- Associated Metadatasets:** A section showing related datasets, with one entry "posted by Maria".
- Comments:** A section for user feedback, with one comment visible: "Der Autor kauft auf dem Campus der neuen Universität, wo er lehrt, ein Haus. Der".

Fig. 1. Screenshots of the ALOE user interface

3.2 Architecture

ALOE consists of two components: The FLOR Connector which is the graphical user interface and the FLOR Web Service which is the Web interface to our system. Both components will be presented subsequently.

The FLOR Connector realizes the user interface to ALOE's Flexible Learning Object Repository. It adheres to design principles which are intended to encourage user participation. The component has been implemented by using the JavaServer Faces³ (JSF) technology. Compared to technologies like JavaServer Pages⁴ (JSP), JSF offers several advantages. For instance HTTP requests can automatically update the data of user interface components. Also fine grained event handling mechanisms are offered (e.g., for value change events in user interface components like list boxes) that could otherwise only be provided via client-side technologies.

The FLOR Web Service has been implemented using the Apache Axis⁵ technology thus providing a SOAP⁶ API. As ALOE offers its data and functionalities as services it may be easily integrated into different applications and contexts. In order to implement the functionalities of the FLOR Web service two underlying technologies have been used: The content repository Jakarta Slide⁷ and an Oracle⁸ database. In ALOE the resources which are submitted as files as well as user-defined metadata sets are stored in a Jakarta Slide content repository. Jakarta Slide offers full WebDAV support which enables direct access to the resources and user-defined metadata sets via their URI. Transactions and locking are provided so that data integrity can be ensured. Further data is stored in an Oracle database as this meets best our requirements, e.g., for the aggregation of metadata and the provision of different views on different types of content.

4 Summary and Future Work

Supporting users in sharing learning resources and information about them is a key factor for the success of any modern e-Learning approach. When realizing such a platform that meets the needs of today's learners, it should be possible to incorporate any kind of resource available in the Web or a local repository, as well as content generated by the learners themselves. To ease the use of the learning resources, information enabling basic functionalities, about technical requirements for the usage, and about the way in which a resource may be used

³ <http://java.sun.com/javaee/javaserverfaces/>

⁴ <http://java.sun.com/products/jsp/>.

⁵ <http://ws.apache.org/axis/>

⁶ <http://www.w3.org/TR/soap/>

⁷ <http://jakarta.apache.org/slide/>

⁸ <http://www.oracle.com/database/index.html>

(intellectual property rights) should always be provided. Additionally, the use of resource profiles is recommended to allow an adequate description of resources.

A user interface that stimulates users to participate, options to import and export information in an easy way, methods to aggregate the collected information, and the possibility for users to use functionalities in their usual contexts and applications are very important to ensure that the harnessing of collective intelligence will be successful.

The ALOE system realizes such an approach, and it will be extended in the future to serve as a socially aware resource and metadata hub for various topics and stakeholders.

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