

SEMantic Internet Education (SEMIE) Tool

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Abstract: SEMIE – SEMantic Internet Education is a browser-like tool offering a new modern way of learning using Internet for getting newest information and social media functionality but also incorporating traditional eLearning methods like usage of SCORM objects. The learning experience is tailored to user's profile, preferences and social network activities. An additional advantage of using SEMIE is the automatic update of content, ensuring that students always get the newest eLearning content. Users can annotate and collaborate with other students and teachers using SEMIE user interface and add additional content from the Web or manually create content. Content and annotations can be private (me only), shared (with friends or class) or public (available to everyone in the school or even on the Internet). In addition to the learning experience SEMIE can connect you with people visiting the same courses and sharing the same interests by acting as an intelligent agent.

Introduction

Nowadays, in a digital world we are living in, a web browser is our portal to the world! If you think about the way we retrieve and consume information, it becomes obvious that we increasingly use the Web for this. Even if we want to learn something we usually search for it on the Web and only if we need more information, we seek to ask others or buy a book (preferably online). This behaviour is also reflected in the way students are learning. Web is full of redundant information that makes it almost impossible for a human being to retrieve and understand. For example if we search for "Goethe" on the Web, eg. using Bing Search Engine, we get back 11.500.000 results! As we see from this numbers - the amount of available information is immensely increasing and the processing of the relevant information to each user consequently requires a huge cognitive effort (see Lee & Brusilovsky 2007). It is almost impossible to read all this and to put it in relation in order to find the best information. In order to cope with this information overload problem, we need information retrieval technology focusing encompassing different sources of data and concentrated on user's exact needs (Brusilovsky, 2001), (Korica-Pehserl & Latif 2011). There is clearly a need for a software tool which would organize this kind of content, rank it according to the quality of the results and annotate it with user comments in order to facilitate learning from the Internet. In addition this information should be consolidated with other related sources and community generated content. All the content on a given subject then needs to be summarized (at least semi-automatically) with the most important parts displayed and with links to further reading. In addition, nowadays, lots of communication between teachers and students is done online, especially via email. Also more and more educational

institutions are using social media like Facebook and Twitter in order to communicate with their students - see for example (Gruber 2011), (Lindner 2006), (Chen et al 2008), (Kerres 2006), (Grosseck & Holotescu 2008), (Lindner 2006), (Kerres & Preußler 2009), (Ebner et al 2010), (Ebner (2009). Currently there is also a joint collaborative online project from Graz University of Technology and Salzburg Research about Technology in Learning and Teaching (see Ebner & Schön 2011).

Our tool is also a step in this direction. Therefore with SEMIE – SEMantic Internet Education Tool – we are proposing a new modern way of learning incorporating traditional eLearning methods like usage of SCORM objects and combining them with the current information on the Internet, and all this tailored to user's profile, preferences and social network. By using SEMIE, students have a comprehensive and all-in-one view on information on a given subject – for example for a class on New Media. In addition, they can annotate and collaborate with other students and teachers using SEMIE user interface, for example they can collaboratively work on a special topic and just share the information in the group and add additional content from the Web or manually created for this group. SEMIE tool also incorporates information about experts on the subject as well as it displays the content they have marked important. In addition to the usage via a browser, SEMIE will also be available as an application for smartphones and for slates or iPad.

Approach – A Sample Scenario using SEMIE in a classroom

Teacher can offer classes using SEMIE tool. This is done in two phases: Content Generation Phase and Content Usage Phase.

Content Generation Phase

Imagine you are a teacher and you want teach New Media to your class. The first step would be to start SEMIE application in a browser and surf to the SEMIE public cloud and search for information on New Media. Perhaps there have already been some classes on this or related topics which offer their content. In addition, this content has a quality ranking which is determined from the assessment given by other users. This is combined with an intelligent algorithm which does the comparison of profiles for the users. This means that teachers get recommendations from the tool which content could be interesting for their class. Typically, a teacher in an elementary school gets different content recommendation than a university professor.

Additionally, the teacher also can define a class structure for his whole college/school or university and can link it with existing SEMIE content. Teacher can share this work with his or hers teacher colleagues. This information can be shared in the current university/school and if teachers want they can share it with other universities. SEMIE generated classes also have metadata used as additional information for sharing content in between classes and for further usage in the SEMIE cloud. Teacher can define whether these structures are private, shared (also with whom) or even public. They are saved in a SEMIE cloud which also offers different degrees of privacy: private, shared and public. After this teachers can define new content for each class or can link classes to already existing content from the SEMIE cloud. If they prepare for instance content about Africa for a certain class, they can use this content also for other classes by linking these classes to the SEMIE object "Content about Africa". Furthermore they would search the Web for New Media. For easy content collection without infringing copyright SEMIE uses SIP (Simple Presentation) tool as described in (Trattner 2010). SIP is a server based application module that does not require the installation of any software on the user's PC or workstation. This tool allows users to gather an arbitrary set of Web pages into a special format, for example into a presentation. Teachers can also import SCORM (see SCORM 2011) content into SEMIE classes. In addition, the classes created by SEMIE are SCORM-compliant and therefore reusable by any SCORM conformant learning management system. SEMIE is not designed to be a replacement for familiar Learning Management Systems (LMS), see (Moodle 2011), (OLAT 2011), (Blackboard 2011), (WebCT 2011), (TC TUG 2011) for examples, as it does not include student administration tasks or any grading system. Indeed SEMIE is a tool between a learning management system and a personalized learning environment. The purpose of PLE (Personal Learning Environment), see (PLEF 2011), (PLEX 2011), (PLE TUG 2011) for examples, is not so much to handle the administrative goals of offering a class but to support the learners (Wilson et al 2007), (Ebner & Schön 2011), (Junghuber 2010), (Schaffert & Kalz 2008). SEMIE extends current PLE functionalities with an online newspaper for eLearning paradigm: bringing the new functionality of dynamic content update

via agents and granular matching algorithms to find appropriate and interesting additional content for the user. In addition SEMIE tries to follow the Web 2.0 paradigm: It uses content from the community and also giving back content to the community.

Teachers can decide to invite experts to collaborate on their class. The experts can be other teachers and/or scientists or other distinguished persons who work in this particular domain of knowledge. These persons can create content and also annotate the existing content. The information they create can be saved as public or shared content, which is e.g. only usable for a certain institute or school. Quality of the content is an important issue for SEMIE. There is an authoring process that insures that the content which is marked as expert content can only be submitted by a small group of experts. In addition to this there is a ranking system as described above.

Content Usage Phase

SEMIE offers two basic views. The first view gives an overview of the different SEMIE areas which are accessible. These are public, shared, private and class. SEMIE class is a special area important for the Content Usage Phase. This area shows only SEMIE content prepared by your teacher for each class. That means if you are enrolled in several classes your class area is divided into further class sections. By navigating to your class sections you can see the class tiles with learning materials. Every tile is displayed in a certain color code. This color code shows how topical the information is: for instance, red means changes in the last 2 hours, and so on. If it is grey you already have read this information. The second view opens when you drill into a tile: Then the information is displayed similar to reading a newspaper with your class information. In this view you can add your own content (e.g. Excel sheets etc.) and your annotations. If you click on the friend icon left you can read and edit (based on the security settings) the annotations of your friends. The user interface is designed to give you full control of the look and feel of your learning content. That means that you are in the position to arrange and sort the tiles in the way you like or in the sequence you want to absolve your class content.

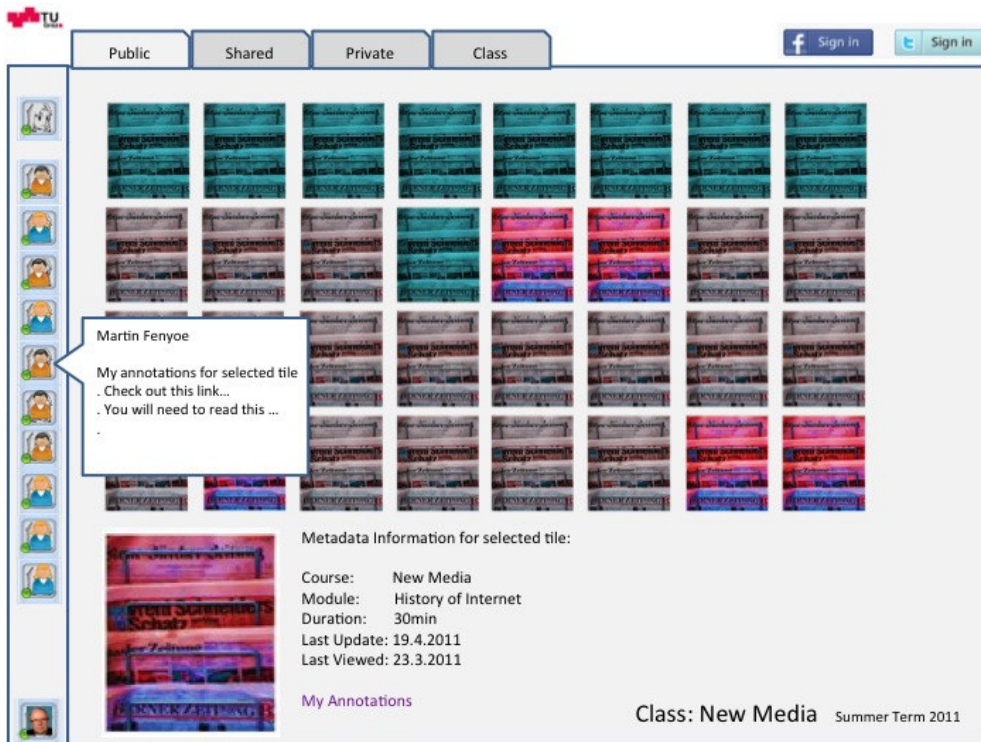


Figure 1. SEMIE Tool Interface in the overview

Figure 1 above shows the overview of the user interface for SEMIE tool. In the overview (= first

view), on the left side you have all the information from people which are learning for the same class: It is similar to a list of friends doing the same work. By clicking on the different friend icons you can see the annotations of these users for the current class content and you can even start a live chat if the person is online. The information of the status of this user (frame of the icon) shows green for online, yellow for offline and red for not to be disturbed. The ability to chat is incorporated by the functionalities of Facebook or other systems which are capable of delivering such information. From a technical perspective this incorporation is possible because of the modular design of SEMIE. At the left side at the end of the user interface you also have the content the teacher has prepared for this class. You can also communicate with your teacher if necessary and you even can see her/his annotations of the content by clicking on the profile picture. At the lower end of the user screen you have a larger image of the tile you have selected and additionally displayed metadata of this tile for your class. If you then click on the tile you get to the second, more detailed view displaying the data from the selected tile.

Architecture of SEMIE

SEMIE is an application which uses the capabilities of the cloud to deliver a new experience for eLearning applications. The storage is divided in three areas. It is very important that all storage content can be combined if you have the access rights to use it. That means for instance you can search for content about a certain topic in the SEMIE public cloud. You then can use this content to combine it with your own research by using SIP and store it in your SEMIE Private Content Area (SPCA).

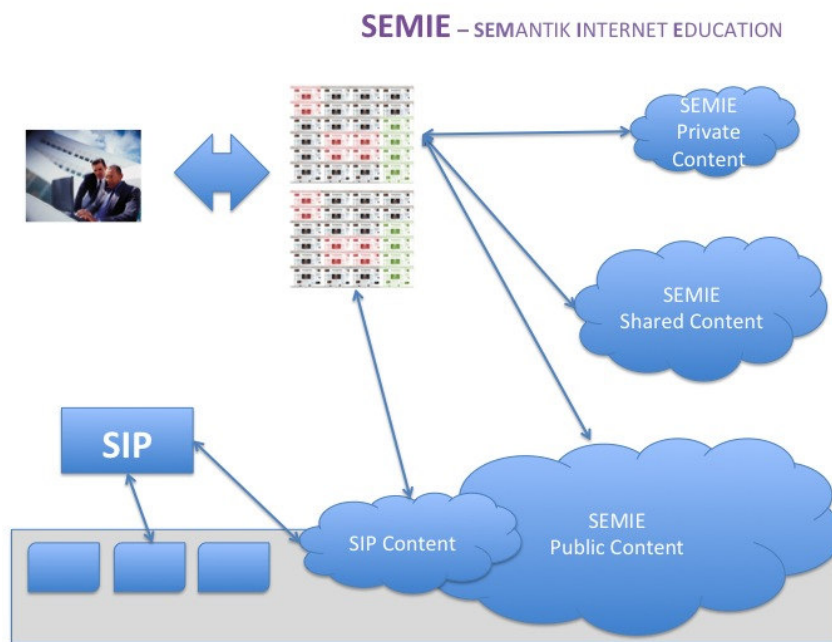


Figure 2. General Architecture Overview

As you can see in the diagram above a so called SEMIE user can have access to all areas to use the content stored in this areas. By using the functionalities of SIP a SEMIE user can take the content created by SIP and use it for further processing. SIP is a very important part which is used by SEMIE to enable user to make internet researches, add own generated content stored on the SIP server. When using SEMIE the user accesses the SIP server. User takes content from SIP and transfers it to his or hers SEMIE area (public, shared, private) in order to use this content in the SEMIE world. Because of using SIP as a solution for generating content from the Internet SEMIE avoids the problem of copyright violation because the information is usual not stored on your SEMIE area and the original content is only available under the exact URL where it is published to the internet but it is referenced in your dedicated SEMIE area and enriched with certain important metadata, like data for called content of certain webpage.

SEMIE Public Content

This kind of content is used to store information from different sources (SIP, SCORM and other content) in a publicly available area. You have access to this area only by using your authentication (this authentication could be Facebook or any other authentication system which is supported by SEMIE and is available for the user) The SEMIE Public Content area is the only area with ranking capability for better search results. This ranking algorithm enables SEMIE to recommend you content which is used by other “similar” users because of their hobbies and profession. This will be described in detail later in the chapter.

SEMIE Shared Content

This part of the storage area will be used to generate and consume content which is only available for a restricted group of users. You can combine your searched public content, which additionally is refreshed if there is new content available. This functionality is optional and can be enabled by the user.

SEMIE Private Content

This is your personal storage in the cloud. It is used for conducting your own research and store your results generated from different sources. If you have finished research work you can transfer your SEMIE content to any other of the already named areas to share it with your peer SEMIE users. If you transfer it to the SEMIE Shared Content Area (SCA) you are able to generate content only available for your own dedicated learning instate. SEMIE Private Content and SEMIE Shared Content are areas from where content can be linked to classes by using SEMIE Class Content.

SEMIE Class Content

This is a very special area of SEMIE only used to store linking information between SEMIE areas and classes and relations between SEMIE User and SEMIE classes. The task of this area is to organize all relations which are necessary to define class content and link this content to your students and store also metadata information about the different users, students and teacher. Another very important part is also to store the annotations of students and teachers as an information object linked to content of certain classes as you can see in the diagram below.

SEMIE – SEMANTIC INTERNET EDUCATION

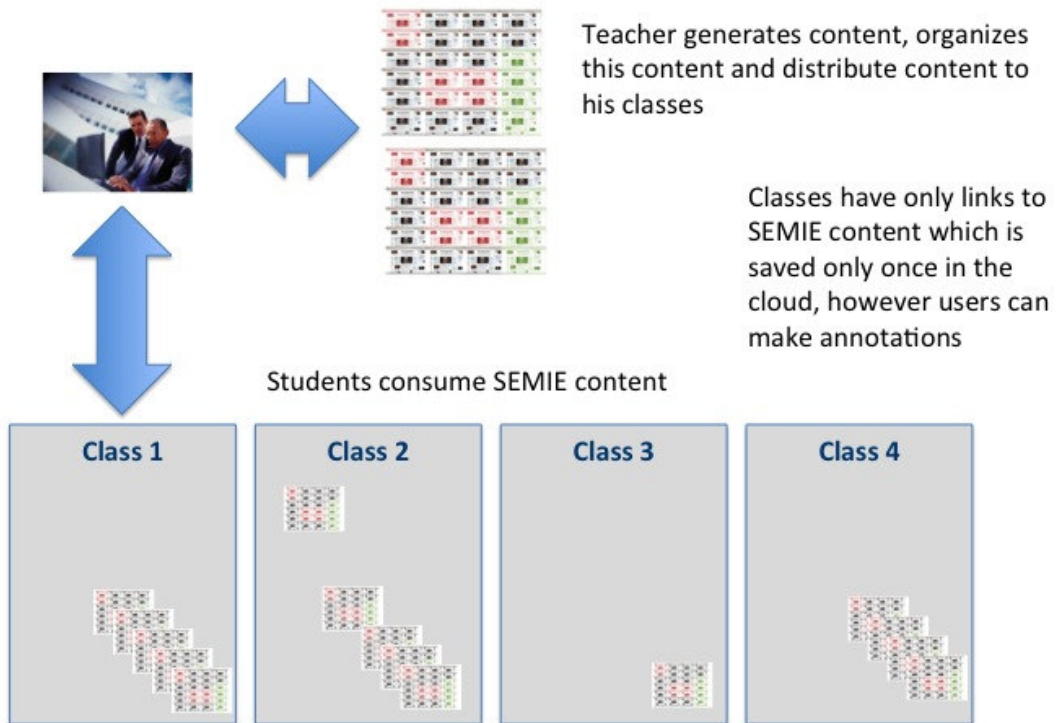


Figure 3. Relation between SEMIE content and Class content

One of the principal functionalities of SEMIE is to store content with different access rights and use this content to link it with classes and students to enable them to consume this generated information and even discuss it with their student fellows.

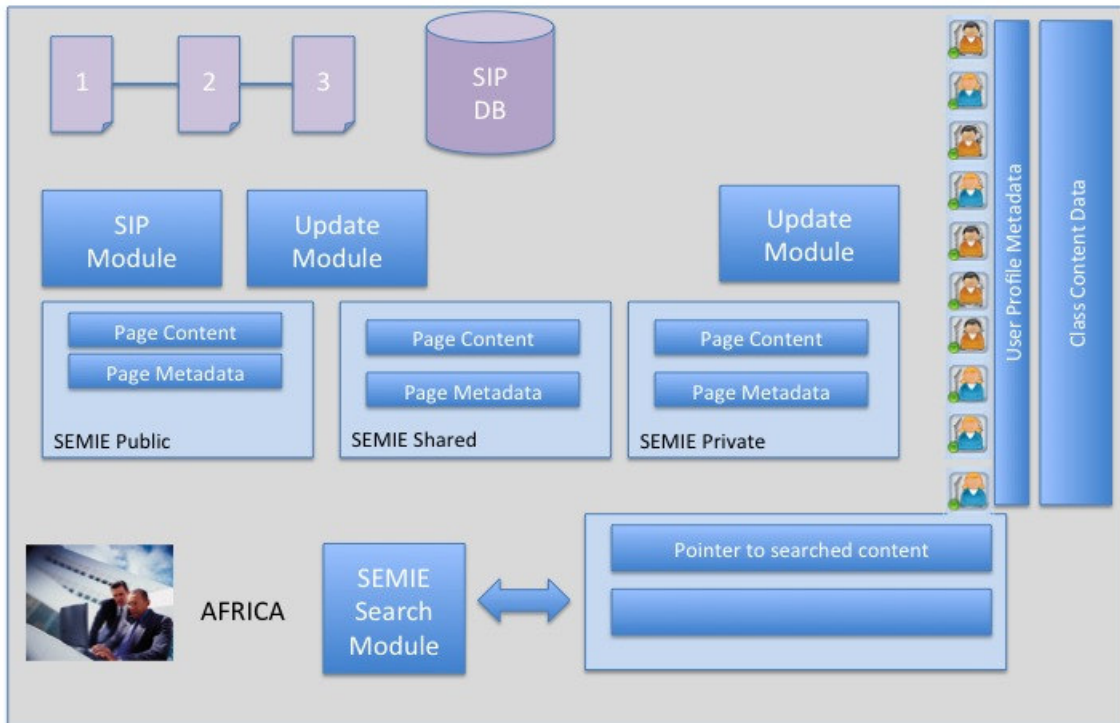


Figure 4. Storage Concept with overview of User, SIP and SEMIE content

For explaining the storage system we start from a search for a specific term using the SEMIE Search module. This module searches for content in the different storage areas: public, shared and private. The Search module then ranks the results by using the matching and ranking algorithm (already mentioned above) which works with the stored page metadata. The page content stores information about the content generated from the Web search by using SIP or self-created content. The implementation of SIP protects against possible copyright violations. In order to deliver the annotations functionality and to enable communication with friends or students in certain classes it is necessary to store user profile metadata and class content data in SEMIE. All data is stored in the cloud which enables SEMIE to be flexible, scalable and highly available.

Additional Social Aspects of Using SEMIE

In addition to the learning experience SEMIE can connect you with people visiting same courses and sharing same interests. Besides using SEMIE for adding your own content and annotations you are able to search for information that people with similar habits, hobbies or professions are interested in. If you like this you can subscribe to this information. SEMIE behaves like an intelligent assistant that learns what the user likes, his or her interests and maybe even what could be interesting for him or her because others visiting similar courses already have put content together and they are willing to share this.

For instance if you are teacher teaching is mathematics and you prefer to get real-time or regular updates with the newest content about that topic, there are different ways to get this information by using SEMIE.

- You teach your SEMIE engine that you are interested in mathematics by searching content about this topic. A SEMIE agent has now the information to follow the defined links and look periodically for

updates of the content to include it in your SEMIE paper. By switching the Internet to a Semantic Internet it is planned that the SEMIE agent is also intelligent enough to recognize interesting links on web pages.

- Alternatively SEMIE will recommend to you information from other users (if they allow this in their privacy settings) who share the same interest. It is also possible to search for public SEMIE databases about mathematics to include them in your own.

Whenever there is new information in the Internet, the “shared mathematics newspaper” is updated and your content in your newspaper is refreshed with this information. Out of this feature there emerges an interesting business scenario for companies or publishers. They can offer SEMIE information tiles, for example using a SEMIE market place. These tiles would contain consolidated content they want to share with SEMIE users by using their know-how about special topics.

Summary and Future Work

We have briefly presented a new tool SEMIE – SEMantic Internet Education Tool which is browser-like new modern way of learning using social multi-media but also incorporating traditional eLearning best practices and combining them with the information on the Internet. SEMIE delivers this content tailored to user’s profile, preferences and social network. Additional advantage of using SEMIE is the automatic update of content, ensuring that students always get the users can annotate and collaborate with other students and teachers using SEMIE user interface and add additional content from the Web or manually create additional content. In addition to the learning experience SEMIE can connect you with people visiting same courses and sharing same interests by acting as an intelligent agent.

A number of components of SEMIE discussed above are currently tested in prototype systems in connection with new Microsoft products and are showing encouraging results.

In the future it is planned to implement a more granular role concept where teachers can also be students or students can also be experts in some areas. First experiments indicate that a further improvement of the functionality of agents is of critical importance, especially as far as the recommendation engine is concerned that is suggesting additional materials to students based on their profile.

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