Generic Responsive Adaptive Personalized Learning Environment

From 2008-02-01 to 2011-01-31

Project details

<table>
<thead>
<tr>
<th>Total cost:</th>
<th>Topic(s):</th>
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<tr>
<td>EUR 5 303 577</td>
<td>ICT-2007.4.1 - Digital libraries and technology-enhanced learning</td>
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<th>EU contribution:</th>
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<td>EUR 3 850 000</td>
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<th>Coordinated in:</th>
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GRAPPLE has delivered a truly generic and extensible technical infrastructure to support life-long adaptive learning

Project Goal

To deliver to learners a technology-enhanced learning environment that guides them through a life-long learning experience, automatically adapting to personal preferences, prior knowledge, skills and competences, learning goals and the personal or social context in which the learning takes place.

To achieve this goal GRAPPLE has developed the following:

- A common abstract description of desired adaptive behaviour, using conceptual adaptation models, and a 'translation' to lower level adaptation rules that can be used by actual adaptation engines.
- Authoring tools to define conceptual adaptation models, capturing relationships between concepts that are of a navigational and/or pedagogical nature, e.g. prerequisite relationships. In order to 'package' a learning application consisting of domain-dependent information and conceptual adaptation models, extensions to standards will be proposed that can represent all required information to port learning applications between different adaptive learning environments.
- A general purpose adaptation engine that can adapt any (xml) information, either as part of a pipeline from source to user-interface, or as a stand-alone adaptive learning environment that performs adaptation and complete user-interface presentation.
- User modelling services that keep track of each user's learning process in order to provide input to the adaptation engine to base the adaptation on.
- A distributed user modelling architecture will be designed and developed to link different adaptive learning environments and user modelling services together, and to perform retrieval and reasoning over user modelling information coming from different services.

Final Results

The main result of the project is a generic learning environment, integrated with five different Learning Management Systems (LMS) in order to enable adaptive life-long learning for learners in higher education and industry.
The GRAPPLE architecture consists of:

- LMS, for managing the learning process, progress and support,
- GALE, an Adaptive Learning Environment, for the adaptive delivery of learning material; support of learning itself,
- GUMF, a generic User Model Framework, for collecting and maintaining the information about each learner from all possible sources in order to help the personalisation offered by GALE,
- GEB, a generic Event Bus, that facilitates asynchronous information exchange between all GRAPPLE components,
- GAT, a graphical authoring tool, for defining the adaptation by course authors, a single sign-on facility that ensures that all GRAPPLE components recognize the learner through a single identity.

The generic nature of the infrastructure has been exemplified by developing a number of extensions: visualisation tools that help learners and teachers to get overviews of their learning progress (or that of their students), adaptation to courses that employ Virtual Reality, and adaptation in learning through simulations.

The adaptive functionalities are integrated in different existing LMSs, either open source (Moodle, Claroline, Sakai) or proprietary systems aimed at corporate learning applications (realised by GRAPPLE's industry partners). This ensures that GRAPPLE can easily be integrated with LMSs that have not been used by the project.

An evaluation framework was set up and used extensively to validate the usability and effectiveness of adding adaptive behaviour to learning applications, in higher education and in corporate settings.

**Objective**

The GRAPPLE project aims at delivering to learners a technology-enhanced learning (TEL) environment that guides them through a life-long learning experience, automatically adapting to personal preferences, prior knowledge, skills and competences, learning goals and the personal or social context in which the learning takes place. The same TEL environment can be used/accessed at home, school, work or on the move (using mobile/handheld devices). GRAPPLE will include authoring tools that enable educators to provide adaptive learning material to the learners, including adaptive interactive components (visualizations, simulations, virtual reality). Authoring includes creating or importing content, assigning or extracting meaning from that content, designing learning activities and defining pedagogical properties of and adaptation strategies for the content and activities. To ensure the wide adoption of adaptation in TEL GRAPPLE will work with Open Source and commercial learning management system (LMS) developers to incorporate the generic GRAPPLE functionality in LMSs. Evaluation experiments in higher education and in industry will be performed to verify the usability of the GRAPPLE environment (for authoring and delivery) and to verify the benefits of using adaptive TEL for the learning outcome. Apart from stimulating the use of adaptive TEL by making it available to every organization using a (popular) LMS the GRAPPLE consortium will also organize training/evaluation events to help higher education institutes and companies with the adaptive learning design needed to create adaptive learning material, and to receive usability feedback which the project will use to improve the user interfaces. A distributed user modeling service architecture will help end-users to stay in control of their user profile while at the same time allowing them to use the profile to get personalized access to learning applications offered through different LMSs by different organizations.

**Related information**

- Feature Stories - Lifelong learning that adapts to you
- GRAPPLE publishable summary
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