



A vision for truly adaptable and accessible learning objects

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In the present landscape of technological and social change, the increasing demand for new educational approaches and pedagogies, and the growing emphasis on the need to cater for the needs and preferences of the individual learner, are shifting the focus to the integration of adaptive and ubiquitous learning. In order to respond to the challenge of providing truly learner-centered, accessible, personalised and flexible learning, this research suggests a solution which is based on the principle that learning content can be generated from adaptable aggregations of learning objects and media components using proven learning patterns. This paper proposes a transformation, augmentation and substitution service (TASS), which by using a variant of IMS AccessForAll works on available metadata and user profiles to generate alternative, equivalent learning experiences relating to a user's declared needs, preferences and learning styles. TASS encompasses methods to retrieve a learning object upon request by a user, unpack and disaggregate the learning object, execute the adaptation process, re-aggregate the learning object components and deliver the adapted learning object to the user in the form in which it is required.

Keywords: adaptability, accessibility, learner profiles

Introduction

With the rapid pace of change in web technologies has come the ability to easily deliver educational materials in electronic form to anyone, anywhere and anytime. Virtually any student, irrespective of any disability, can be enabled to effectively interact with a computer (Nevile et al., 2005). However, some students with disabilities require alternative access systems, usually referred to as "assistive technology," to enable them to achieve this or require content on the computer to be presented to them in different modalities or styles. Online learning can be a liberating and enabling experience for disabled students, providing that the environment is designed to meet the needs of the individual (Pearson & Koppi, 2006). In terms of access to or interaction with online learning resources, disability can be re-defined as a mismatch between the needs of the learner and the learning environment or education delivery (IMS AccessForAll, 2004). In order to achieve an accessible relationship between the resource and the user, descriptions of user needs and preferences are checked against descriptions of resource components until they match. This process involves a description of a user's control, display and content needs and preferences being matched with a description of the components of the learning object (Nevile et al., 2005). This paper suggests a transformation, augmentation and substitution service (TASS) which can be viewed as a special instance of an AccessForAll service and is designed to address the need to author adaptable and accessible learning objects that can be matched with learners' personal profiles.

Accessibility service

The concept of TASS assumes the use of rich media content which is now widely used to enhance the quality and the effectiveness of learning activities often accessed on different devices. Multimedia learning objects delivered in distributed formats differ from standard web pages in that they may consist of rich content, each of which may need to be adapted in different ways in order to make them accessible. To make this rich online content match individual needs and preferences is a significant challenge for the designer. A basic resource needs to be created from existing, or newly authored components and then adapted for the individual learners' needs. This may involve the substitution, augmentation or transformation of components of the resource such as changes in sensory modality (Jones & Pearson, 2006). A transformation may occur where text is rendered visually, as characters, or a sign language, or aurally, perhaps by a screen reader, or transformed into a tactile form as Braille or simply changed in colour, size and other display features. Augmentation involves the optional addition of a feature to a

primary resource, for instance a textual caption could be added to a video when required by a user with a hearing impairment or in a noisy environment. Substitution might occur when a user requires a vision-free access to the resource, for instance an interactive exercise requiring a mouse for operation could be substituted by one that can be controlled using a keyboard or keyboard emulator for a user with a mobility impairment.

TASS at work

In simple terms the service is triggered by the user making a request through the TASS interface, which retrieves the learner's profile. The request is passed on and the service checks the learning object repository for the object's accessibility element and compares it with the user's profile. The TASS retrieves the learning object that is requested and defines a corresponding adaptation strategy, based on the learner's profile and the available learning object components. Appropriate transformations, augmentations and substitutions are applied, before the adapted learning object is delivered to the user.

The service comprises of two main components, the learning object authoring tool and the profiling mechanism. For the purpose of this research, the Learning Object Tutor Tools Interface (LOTTI) authoring tool has been developed, along with the integrated TASS Accessibility wizard component. This research suggests that the solution to develop adaptable learning objects lies in learning object authoring tools which would support the author in creating fully inclusive materials by suggesting alternative elements and sometimes imposing the completion of all additional information needed to ensure accessibility. LOTTI and its TASS extension provide the resource creator with the ability to produce learning objects that are reusable and adaptable to the learners' profiles, by applying the use of learning patterns and methods to identify alternative resources and assign metadata to them. The learner profiling tool is the other main component of TASS which allows a learner to create an anonymous profile based on the use of the IMS metadata protocols, implementing the ACCLIP specification. A prototype learner profile tool, the Profile for Adaptable Learning (PAL) has also been developed which provides a straightforward and easy way for the user to customise the selection and presentation of content based on preferences including access requirements, content views, style preferences and equivalent content requirements.

In order to identify and model the TASS in terms of requirements for delivery of learning objects adapted for different mediums, devices and requirements a number of sample learning objects have been created. This has enabled the specification of requirements for adaptability (e.g. Gkatzidou & Pearson, 2007).

Conclusions and further work

The work to date has resulted in the development of the two main components of TASS – the LOTTI authoring tool and the PAL profiling tool. Current research focuses on exploring the additional components of the service and the technologies that will need to be applied in order to implement the service as a whole. The next stage includes the adoption of a more detailed profiling solution within PAL to extend the learner preferences to include specification to take into account device characteristics, and the user's learning styles before the system is further tested to assess the extent to which TASS can respond to the challenge of providing adaptable, personalised and accessible learning.

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Please cite as: Gkatzidou, S. & Pearson, E. (2008). A vision for truly adaptable and accessible learning objects. In *Hello! Where are you in the landscape of educational technology?* *Proceedings ascilite Melbourne 2008*. <http://www.ascilite.org.au/conferences/melbourne08/procs/gkatzidou-poster.pdf>

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