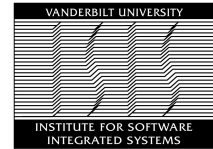


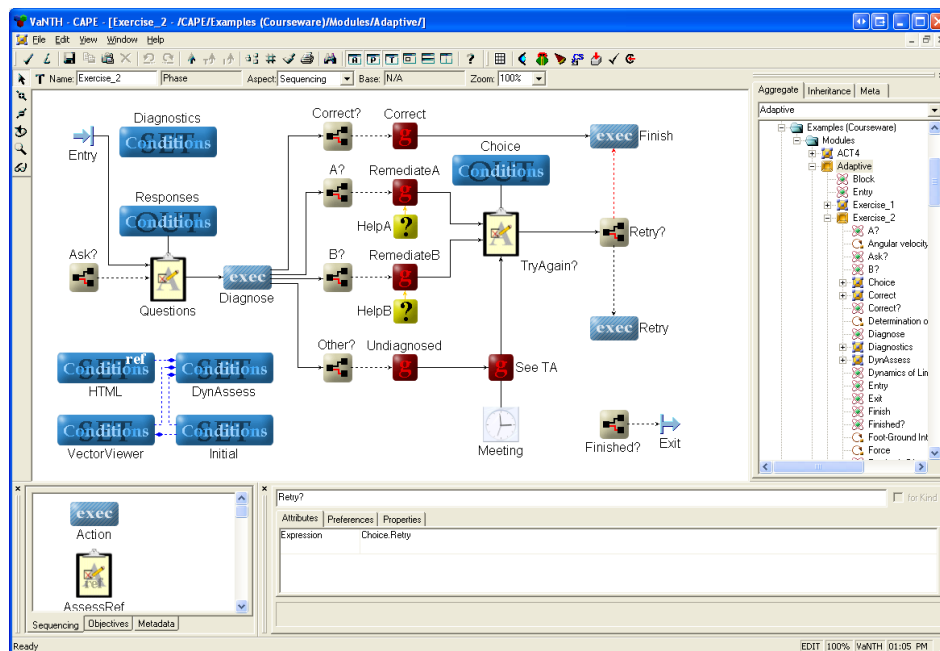
The Courseware Authoring and Packaging Environment (CAPE) and experimental Learning Management System (eLMS)



Summary of Features

CAPE and eLMS comprise a technology infrastructure that supports the design of adaptive, web-based learning experiences, the integration of learning materials with those designs, the instrumented enactment of the designs with learners, and reflection by educators on the designs using the collected instrumentation. This infrastructure was created as part of the National Science Foundation Engineering Research Center for Bioengineering Educational Technologies (VaNTH), a collaboration involving learning scientists, learning technologists, assessment and evaluation experts, and bioengineering educators (<http://www.vanth.org>).

CAPE supports a visual modeling language used to specify enactable designs for online learning experiences. It is realized as a domain-specific specialization of the Generic Modeling Environment (GME) from ISIS, q.v. CAPE models capture many kinds of design specifications. Sequencing models specify behavior associated with a learning design embodied as a set of hierarchical, interconnected, scoped, and typed model containers. These models involve content elements (static or dynamic), assessment elements, and adaptation elements. Adaptations are specified using conditional delivery concepts in conjunction with a data modeling facility, and these representations are extended with derived data, logical expressions, statements, and functions specified in the Python dynamic programming language. Complementing these behavioral specifications are models that capture learning objectives and their associations with content knowledge represented by domain taxonomies. Resource models represent dependencies of a learning design on static, file-based digital content, together with standards-based and community-specific metadata. CAPE models are transformed into the enactment-time representation used by the eLMS platform, and are packaged with dependent content for deployment.



The eLMS is a web services platform realized using the Zope web application server (<http://www.zope.org>). Web services manipulate a set of domain-specific objects: classes, users, courseware, assignments, and enactment (delivery) records (among others), and they support primarily content interoperability and platform interoperability. eLMS provides a sophisticated versioned content management system based on “digital fingerprinting” of resources and the associations of content versions with versions of learning designs. To support design reflection, eLMS provides a data mining facility that educators can use to query information from the instrumentation collected by eLMS by means of compound pattern-matching specifications.

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