WebALT – Web Advanced Learning Technologies

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WebALT

- Web ALT project in Finland
- Technical Description
- Shared Development of Materials: an Assembly Line for Courses
- Course Content Definitions (CCDs)
- Roadmap to more effective delivery of high quality education
Web ALT project

- Project at the University of Helsinki supported by the Finnish Ministry of Education and the University of Helsinki
- Aim: To develop best practices in eLearning especially in mathematics and to use them in practice
- Materials and methods have to be developed so that they can stay usable for a long time and can take advantage of new developments
Looking for Partners in Content Development and in Course Redesign

- WebALT projects builds on best current technology
- Proper use of technology will result to a new and more efficient delivery of education
- We hope to build collaboration with several institutes to redesign traditional courses
Join the Crowd – Hopefully our Vehicle is better than this
Aim: to use current tools to

1. Develop good sample content using the MathML/OpenMath, enable sharing
2. Educate colleagues – dissemination
3. User support

Horizontal vs. vertical development.
20 instructors developing and sharing educational materials

- A (pre-)calculus course at a large university may have 20 instructors
- Each instructor develops on-line materials
- Sharing does not happen
- Individual efforts have no permanent value
A common standard for educational materials via Course Content Definitions (CCD)

- Easiest to do in mathematics
- Advanced table of contents
- XML namespace
CCD makes sharing of materials possible
On-line Content in Math

- Adaptive presentation of materials at levels and languages suitable for the students
- Key added value: adaptive interactive exercises allowing:
  - Independent learning
  - Self assessments
  - Automatic testing with partial credits
Web ALT Architecture

CCD - Course Content Definition

Exercise Database  Automatic Testing  On-line Text

Traditional Texts
Adams
Hughes-Hallet et al.
Stewart
Etc. …

Students’ Performance Tracking Databases
Web ALT Exercises

- Exercises are problem trees
- Several Problem Types are supported (multiple choice, true/false, string, essay)
- Problems have dynamic levels of difficulty
- Everything is multilingual – instructors may view the materials in English and students may see the same materials in Spanish
Sample Exercise

Root Problem

\[ \int \frac{x^5 - x^4 + 2x^3 - x^2 + 2x - 1}{x^3 - x^2 + x - 1} \, dx \]

Divide polynomials and find common factors

\[ \int \frac{5}{4x + 3} \, dx \]

Integrate polynomials

\[ \int \frac{5}{4x^2 + 4x + 3} \, dx \]

Report Card with links to relevant on-line texts.
Web ALT Exercises

- Provide same type of help to students as professors during office hours
- Math content encoded either by TeX or by MathML
- XML files
- Support automatic testing with partial credit (through the subproblem structure)
Web ALT CCDs

- Initially local standards facilitating the collaboration of instructors teaching the same course at the same institute
- Building of a widely accepted CCD for a course like calculus is an evolutionary process: good local CCDs get more users and may become global
Calculus at FSU

- Cost of delivery of Calculus I at FSU is about $360K in a calendar year/over 100 sections of calculus I – III courses offered every year
- Automatic testing and proper use of Web ALT tools may make it possible to reduce the number of sections needed; estimated savings for Calc I only $200K/year
- To achieve this extensive exercise database and high quality on-line contents are needed
Roadmap

1. High quality on-line calculus ready by 8/04
2. Develop collaboration at the EU level to support a successful IST proposal
3. Use the on-line calculus to develop a comprehensive Calculus CCD

Support from the 6th FWP necessary to realize the above goals quickly.

High quality online content for basic courses (Calculus, Linear Algebra). Offer the courses over the net. eTeaching / eLearning

Key enabling technology: CCDs

Current Practice:
1. HTML + gifs, pdf
2. Printed materials presented electronically

New delivery method for education based on advanced use of XML+MathML
WebALT for everybody