eMersion: Exploration of a New Paradigm for Web-Based Training

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Outline

- Introduction
- WBT Systems
- Document Technology
- The eMersion Project
- Two New Interaction Metaphors
- Deployment of pedagogical Modules
- Concluding Remarks

http://eMersion.epfl.ch
Introduction

Trends in High Education

◆ Learn to learn, to collaborate and to communicate

◆ Acquire a mastery of the rigor, the complexity and the interdisciplinarity

◆ Stimulate the creativity, the autonomy and the entrepreneurship
Learner-Centered Education

- Learn to learn, to collaborate and to communicate

- Acquire a mastery of the rigor, the complexity and the interdisciplinarity

- Stimulate the creativity, the autonomy and the entrepreneurship
Objective

Increase in Involvement

- Learning by doing
- Hands-on practice
- Trial and error
Objective

Experimentation-Based Education

- Learning by doing
- Hands-on practice
- Trial and error
Evolution

◆ Publishing • Interaction • Collaboration

The challenge is about

◆ new learning technologies?
◆ new learning methods?

... how to integrate the technologies into new learning paradigms!
WBT Systems

A survey

- http://edutech.ch (111 evaluation criterions)

Student
- Access to courses
- Private space and customization
- (A)synchronous communications
- Pedagogical tools

Teacher
- Teamwork
- Tutoring
- Course evaluation

Author
- Production
- Management
- Quizzing
Document Technology

Authoring facilities
Reusability
Collaboration
Telemanipulation
The eMersion Project

What?
- Renewal in the education schemes at EPFL
- Interactive modules for mechanical engineering practice based on new learning technologies

Who?
- Educators in mechanical engineering
- Specialists in new learning technologies
- Advisers in pedagogy and didactics
- IT Development Team

Synergies and Multidisciplinarity
Methodological Focus

Learning by Trial and Error

- Hybrid Experimentation
  simulation • animation • manipulation
- Involvement • Collaboration

Flexibility in Experimentation

- Context, content, place and time

Modularity & Reusability

- Content • Standard technologies: Java, XML, …
Reinforcement

Successive stages and repetitive cycles

Validation

Experiment configuration and settings

Abstraction

Trials

Models

Errors

Selection

Methods and parameters

Implementation

Measurements and results
Hybrid Experimentation

Numerical simulations
Animations
Manipulations

mathematical models
graphical models
real devices

Combined experimentation modes
Two New Metaphors

A cockpit and a laboratory journal

Sustainable Interaction with the experiments

Personalized & shared multimedia notebooks
Remote Experimentation

- Automatic Control Practice in 4 Engineering Majors

Video Image + Virtual Representation
Augmented Reality

States and Measurements

Interactive tuning parameters

Configuration
Rheology of living tissues

- Traditional curricula and continuing education
- Virtual tests on bones, ligaments, cartilages and muscles

Tuning inputs
- Experimental configuration
- Displacement or force control

Sensing outputs
- Test Animations
- Deformations
- Constraints
Fluid Mechanics

Numerical Wind Tunnel

Tuning inputs
- Wing profiles
- Flow parameters
- Numerical methods

Sensing outputs
- 2 or 3D visualization
- Animations
- $p$ and $v$ fields
Concluding Remarks

Enabling Immersion into Knowledge

- Trial and error scheme for involvement
- On line experiments for flexibility
  Simulation • Animation • Manipulation
- Reusable components for deployment
  Knowledge fragments: Content
  Consolidation resources: Experiments
  Interaction interfaces: Cockpits
  Collaboration environments: Lab journals