7 Development of Learning Applications

7.1 Structure of Development Processes
7.2 Preliminary Analysis
7.3 Design: Didactic Concept
7.4 Design: Storytelling
7.5 Design: Segmenting & Sequencing
7.6 Design: Interactivity & Adaptivity
7.7 Development Tools and Platforms

References:

Roger C. Schank: Lessons in Learning, e-Learning, and Training, Wiley/Pfeiffer 2005
William Horton: E-Learning by Design, Wiley/Pfeiffer 2006
Meta-Remark

In case you wonder about the style of slides: Yes, these slides are meant for students actually attending the lecture.
Jerome Bruner on Storytelling

• “There are two modes of cognitive functioning, two modes of thought, each providing distinctive ways of ordering experience, of constructing reality.”

• *Paradigmatic, logico-scientific* mode

• *Narrative* mode

• Jerome Bruner, *Actual Minds, Possible Worlds*, Harvard University Press 1986
Benefits of Storytelling

*What do you think are benefits of storytelling in E-Learning?*

*to be filled in lecture*

See also
http://www.creatingthe21stcentury.org/Intro6-benefits-story.html
Ten Rules for Storytelling (Schank)

1. Use real stories
2. Never tell without using a story
3. Make sure the tellers are authentic
4. Make sure the tellers do not blandify the story
5. Include the "story choice" as part of the story
6. Tell only those stories that can be heard
7. Tell stories just in time (for the audience!)
8. Recognize that story living is better than story telling
9. Surprise your listener
10. The story is chosen as it is created.
Types of Stories

*Which general ways exist about making use of stories in teaching?*

*to be filled in lecture*
Example Story (Horton)

• Denise’s story:
  “About 2 years ago I was living in Boston and I took the subway to work every day.

One Monday, when I went into Park Street station, it was littered with newspaper – newspaper everywhere. I stepped over, around, and through the paper, but I certainly didn’t look at it.

Standing not too far from me, waiting for his train, was a middle-aged man. He was looking around at the mess and then looked down at his feet. He bent down, picked up some of the newspaper and took it to the trash. He did this a few times until his train arrived.

After the train was gone and the station had quieted down a bit, a young woman on the platform bent down and picked up some newspaper at her feet and took it to the trash. Then a young man did the same thing. Finally, we were all in the act. By the time my train arrived, the station looked pretty good – and the trashcans were full.”
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Segmentation and Learning Objects

What is a natural partitioning of learning material?
What are natural units (objects) for learning?

to be filled in lecture
Segmentation and Learning Objects: Example

Natural partitioning for the following topic?

Topic: Concepts of imperative programming  
(Variable, expression, assignment, if-then-else, while)
Patterns of Sequencing

- Assuming, we have a collection of learning segments/objects
- In which order do we deal with the units?

Topics (one or many dimensions)

Depth of treatment (one or many dimensions)

Linear-Successive Style
Spiral Style
Patterns of Sequencing: Example

• Topic: Digital Media/Media Technology
  (digital sound, images and moving images: recording, rendering and storage formats)

• Name possible dimensions of the topic space!

• Which of these dimensions are suitable as primary dimensions for structuring the material?

• Which are sub-dimensions?

• Which are orthogonal to which others?

• Which are suitable for structuring depth of treatment?

• Give examples for different possible sequences of treatment!
Alternative to Hierarchical Analysis: Elaboration Theory

• Reigeluth 1999: Simplifying Conditions Method (SCM)
• Epitomizing: Finding the simplest version of the task which is still representative for the problem
• Elaborating: Teaching increasingly complex versions of the task
• Try to apply this idea to teaching the concept of a procedure/function in imperative programming!

Choice of Sequencing Method

to be completed in lecture

- Which sequencing method is appropriate for these two example topics?
  - Case 1: Lossy image compression with JPEG
  - Case 2: Basic skills in digital video editing
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References:

IMS Simple Sequencing Best Practice and Implementation Guide, v1.0, imsglobal.org
IMS Simple Sequencing

- IMS Global Learning Consortium ([imsglobal.org](http://imsglobal.org))
  - Originally "Instructional Management Systems" project (1997)
  - Global non-profit organisation, 250+ members
  - Defines and publishes learning technology standards
  - For instance: IMS Content Packaging

- IMS Simple Sequencing (v 1.0, 2003):
  - Representation of sequencing for learning activities
  - Covers interactivity and adaptation:
    Different paths through tree of learning objects
  - Abstract data structure together with XML binding

- Similar standardization initiative: SCORM
  - Sharable Content Object Reference Model
  - Advanced Distributed Learning Initiative ([adlnet.org](http://adlnet.org)), founded by U.S. DoD
    Sub-standard "Sequencing and Navigation" (SN)
Problem Space of Sequencing

- Directed
  - Branching
  - Linear
  - Looping
  - Random

- Self-Guided
  - Full Choice
  - Partial Choice

- Adaptive
  - Limited
  - Full
  - Intelligent

- Collaborative
  - Instructor Led
  - One to One
  - Cohorts

Grey = Scope of IMS
Simple Sequencing
Activity Tree
Navigation Control Modes

• Default: Learner can chose any activity in a cluster (sub-tree)
• Rule associated with parent node defines flow through sub-activities

Enabling forward flow for activity AA. The learner sees AAA, AAB, then AAC.
Rule-Based Sequencing - Conditional Rules

Specific nodes have a rule that specifies that they should be skipped under certain conditions.
Rollup Rules: Tracking Results of Activities

Rollup rule: Meets objective if any child meets its objective

- **AA**: Rollup result
  - **AAA**: Status: Does not meet objective
  - **AAB**: Status: Does not meet objective
  - **AAC**: Status: Meets objective
Example: Basic Sequencing Behavior
Dimensions of Adaptation

Which further possibilities for adaptation do we have in e-learning systems – beyond adapting the sequencing?

to be filled in lecture
Dillenbourg/Self: Two-Dimensional Framework for Learner Modeling

• Vertical dimension (problem domain):
  – Problem domain is a triple $\Omega = (P, B, Solution)$ where
    » $P$ is the set of problems
    » $B$ is the (large!) set of possible agent (learner/system) behaviors
    » Behavior $b$ of agent $a$ on problem $p$: $b_{ap}$
    » Solution is a relation between $P$ and $B$
  – Behavioral knowledge of the domain ($bk$)
    » Inference structure to infer some behavior for a given problem
  – Conceptual knowledge of the domain ($ck$)
    » Definition of the concepts underlying the behavioral knowledge
    » May exceed actual problem domain

• Horizontal dimension:
  – Discrepancies between the same entities possessed by different agents

Dillenbourg/Self Model

R representation
l/s agent (learner/system)
Learner Modeling

• Stereotype model:
  – Learner is assigned to one out of a number of predefined classes

• Differential model:
  – Characterizing the learner knowledge by its difference to the system knowledge
    » Misconception: Discrepancy at conceptual level
    » Mal-rule/bug: Systematic discrepancy at behavioral level
    » Error: Isolated discrepancy at behavioral level

• Overlay model (Carr/Goldstein 1977):
  – Model of knowledge (concept network), degree of coverage

• Perturbation model:
  – Coverage of knowledge (like in overlay model), plus
    – Model of learner’s faults (like in differential model)

• Concrete representation: E.g. feature vectors
6 Entwicklung von Lernanwendungen

6.1 Schritte eines Entwicklungsprozesses
6.2 Analyse für Lehr- und Lernanwendungen
6.3 Design: Didaktisches Grundkonzept
6.4 Design: Storytelling
6.5 Design: Segmentierung, Sequenzierung
6.6 Design: Interaktivität und Adaptivität
6.7 Entwicklungswerkzeuge

Literatur:
Issing/Klimsa (ed.), Kap. 13 (H. Freibichler)
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Main Types of Authoring Systems

• Frame-based development
  – Legendary predecessor "HyperCard", nowadays PowerPoint paradigm
  – Well-known product: *SumTotal ToolBook*

• Flow-based development
  – Extended control flow diagram
  – Well-known product (no longer available): *Adobe AuthorWare*

• Timeline-based development
  – Stage and actor metaphor
  – Famous (but legacy) products: *Adobe Director, Adobe Flash*

• Interactive demonstration videos
  – "Screencasting", combined with live audio and video
  – Well-known products: *TecSmith Camtasia*

• Hybrid products:
  – *Adobe Captivate*: Screencasting + frame-based
  – *Articulate Storyline*: Flow diagram + timeline
SumTotal ToolBook

- Company *Asymetrix*, founded by Microsoft-co-founder Paul Allen
- Since 2004 company name *SumTotal* (now a *SkillSoft* company)
Authorware

- Developed by a PLATO collaborator, product since 1987
- Macromedia 1992, Adobe 2005

Adobe Authorware 7

Produce rich-media courseware for e-learning

- Buy or upgrade Authorware 7
- See top 10 Reasons to upgrade
- Take a tour of the features
- Order by phone: 1-800-585-0774

Why does Adobe plan to discontinue development of Authorware?

The eLearning market has transitioned to Adobe Flash® and Adobe Captivate® software over the years. Authorware is a mature product and demand has continually declined to where it is no longer economically viable for Adobe to continue development.

August 2007
Authorware Screen

1 Work area
2 Presentation Area
3 Menu bar
4 Icon-Palette
5 Design window
6 Library
Adobe Captivate

From screen casting to design of interactive dialogues and simulations

Source: Adobe
Articulate Storyline 2

www.youtube.com/watch?v=Brg3RyZ0 To
IMS Learning Design (LD): Standard for Representing Pedagogies

- "A generic and flexible language designed to enable many different pedagogies to be expressed"
Trends

• Mobile devices, tablets
  – Responsive content
  – Touch input
• Web-based delivery
  – HTML5 export
• Location-adaptive learning