An Adaptive XML-based Approach to Multimedia Documents

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Opéra team

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Overview

- Opéra research activities
- Technical presentation
  - Content Adaptation Framework
  - Authoring adapted presentations
  - Adaptation in SMIL 2
Opéra research activities

- Document modeling and transformation
- Multimedia specification

Authoring and presentation systems
- Multi-views, direct manipulation
- Adaptation
- Visual language
Opéra activities (1)

- Document modeling
  - Video structured: go inside video black box (MPEG7)
  - XML transformation
  - Spatial and temporal composition
- Content adaptation
  - Negotiation, transformation, constraints
Opéra activities (2)

- Document generation
  - Automatic generation of multimedia documents

- Authoring systems
  - Structured document authoring
  - Multimedia authoring
  - Transformation authoring
Opéra activities (3)

- Presentation systems
  - User capabilities, multi-platforms
  - Scheduling, QoS (prefetch)
  - Web applications: various network constraints
    - High connection
    - Wireless
Opéra cooperation

- W3C cooperation
  - Amaya team
  - SYMM group participation (SMIL)
- Industrial partners
  - European aircraft company
  - European telecom company
Overview

- Opéra research activities
- Technical presentation
  - Content Adaptation Framework
  - Authoring adapted presentations
  - Adaptation in SMIL 2
A vision of the Web

- User Capabilities
- User Preferences: presentation/semantic
- Localization

=> CC/PP (W3C)
Goals

- Specification of adaptable applications
  - Single document adaptation
  - Document classes adaptation
- Authoring of adaptable documents
  - Instance content
  - Presentations (transformation sheets)
- Tools
  - Model of multimedia presentation
  - Operational architecture
Adaptation architecture

- Negotiation
- Result of negotiation (Transformation Sheets)
- Transformation
- Execution
- Formatting
- Presentation Document
- Profile

Document
Medias
Metadata
Document classes

- Describe a particular domain
  - Presentation schema: multimedia (SMIL), vector graphics (SVG)
  - Application schema: Docbook, ATA, etc.
- Language: DTD, XML Schema
- Allow preferences specification related to a specific domain
Adaptation parameters

- **Static**
  - Reader capabilities
  - Hardware/Software Configuration

- **Dynamic (Document)**
  - Preferences related to document classes
  - Presentation preferences:
    - Window size, interactive (or not) presentation, etc.

- **Dynamic (Media)**
  - CPU resources, current bandwidth
Example: ATA documents

- Describe maintenance tasks
- Preferences related to ATA documents:
  - Generic vocabulary
    - Novice/Expert
    - Table of content
  - Specific vocabulary
    - Inclusion of sub-task description
    - Time estimation for task realization
    - Task procedure synchronization with its corresponding illustration
Presentation languages

- Negotiation
- Result of negotiation (Transformation Sheets)
- Transformation
- Execution
- Formatting
- Profile
- Document
- Medias
- Metadata
- HTML, WML
- SMIL basic
- SMIL 2
Transformation for adaptation

- Input Parameters
  - A lot of adaptation parameters
  - High combinatory
  - Complex and time-consuming authoring

- Solution:
  - The negotiation step produces transformation sheets
Author involvement

Author

XML Document

Transformation sheets

Transformation

Presentation Document

Negotiation

Execution

Formatting

Profile

Adaptation parameters
Source content authoring

- Through a presentation
  - See this presentation
- Need fast transformation
  - Incremental transformation
  - iXSLT: incremental Xalan
- Experimentation with docbook documents
Transformation sheets authoring

- Difficulty: programming language (XSLT)
- Current tools: text editing + debugger

- Our solutions
  - Visual language
  - Direct manipulation
Authoring by direct manipulation

- Build XPath expression in source view
- Drag and Drop expression in presentation view
  - Generate transformation rules
- Need incremental transformation processor
  - ⇒ iXSLT
iXSLT: incremental transformation

Two steps process

- **Preprocessing: transformation sheets analysis**
  - Build templates and variables dependency graphs
  - Build re-evaluation rules
    (Editing operation, Instructions to be re-evaluated)

- **Incremental processing**
  - Execute the instructions computed during the first step
Conclusion

- Experimentation in
  - Opéra prototype **Kaomi** (authoring tool)
  - Xalan (transformation processor (Apache))
- To-do:
  - Experiment optimization techniques in Xalan
  - Enhance transformation rules generation
    - Distinction between generic and specific editing
    - Use schema knowledge: better rule generation, checking during edition
SMIL 2.0 : conception (1)

- Meta language
  - From simpliest multimedia document
  - To more sophisticated
SMIL 2.0 : conception (2)

Language space

1 application profile

Functional space

Vectoriel animations

Syntax
Composition and programmation space

DOM 1-2
SMIL DOM

XML
Namespaces
Conclusion

- Very large impact in industries
  - More browsers (HTML+SMIL in IE6)
  - More authoring tools
  - More servers

- To-Do
  - Fine grained control on media
  - Streamable SMIL
  - SMIL2.0 DOM