Adaptive Hypermedia for All - AHA! (Adaptive Hypermedia Architecture)

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Contents

• Introduction to Adaptive Hypermedia
• Implementation of a General-Purpose Adaptive Hypermedia System AHA! (Adaptive Hypermedia Architecture)
• Creation of Adaptive Applications with AHA!
• Visualizing Adaptive Applications in the Browser
  – examples with learning styles application
  – eShop example
• Conclusions and Future Work
Adaptation helps in many situations
Where Can Adaptation Help: Cognitive/Learning Styles Example

*imager vs. verbalizer*  
*global vs. sequential*

*active vs. reflective*
What is Adaptive Hypermedia (AH)?

Hypermedia – non-sequential information, which is a combination of different media (such as text, images, audio)

Classic example of hypermedia: World Wide Web (WWW)

Problems with traditional hypermedia:
• navigation through a rich link structure
• the same information for everyone

Adaptive Hypermedia & Adaptive Hypermedia Systems (AHS) allow to solve traditional hypermedia problems. They store user information in the user model and apply it for:
• adapting link structure and
• adapting content presentation
Adaptive vs. Adaptable Hypermedia

Personalized hypermedia

Adaptable (customizable) hypermedia
- User-tuned

Adaptive hypermedia
- System-tuned
Classic Loop “User Modeling-Adaptation” in AHS
Application Areas of AHS

• *Special-purpose* AHS used for creating e.g.:
  - online educational courses
  - virtual museums
  - online information kiosks
  - e-commerce applications like web-shops
  - etc.

• *General-purpose tools*
AHAM Model
(Adaptive Hypermedia Application Model)

AHS = <Domain model, User model, Adaptation model, Adaptation Engine>

/ Where innovation starts
Design Requirements for a General-Purpose System

- adaptation types and techniques (overview of AHS)
- aspects used for adaptation (overview of AHS & AHAM)
- arbitrary concept relationships (overview of AHS & AHAM)
- generic adaptation rules (AHAM)
- handling non-monotonic user model updates and cycles in adaptation rules (AHAM)

Design wishes
- Authoring tools (overview of AHS)
- Performance (overview of AHS)
AHA! : from version 1.0 to version 3.0

AHA! engine

Java servlets

WWW server

DM/AM
local pages
UM

End-user

DM - Domain Model
AM - Adaptation Model
UM - User Model

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What Do We Want to Adapt in AH?

• Adaptive navigation (adapting link structure)
  – adapting the link anchors that are shown
  – adapting the link destination
  – giving “overviews” for navigation support and for orientation support

• Adaptive presentation (adapting content presentation)
  – adapting the information
  – adapting the presentation of that information
  – selecting the media and media-related factors such as image or video quality and size
Taxonomy of AH Technologies
Design Requirement
“Adaptation Types and Techniques”

### Adaptive presentation

<table>
<thead>
<tr>
<th>Adaptive multimedia presentation</th>
<th>Adaptive text presentation</th>
<th>Canned text adaptation</th>
<th>Adaptation of modality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Language Adaptation</td>
<td>Inserting/removing fragments</td>
<td>Stretching</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Altering fragments</td>
<td>Sorting fragments</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dimming fragments</td>
<td>Yes</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes but may require AJAX</td>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes but may require AJAX</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Adaptive navigation support

<table>
<thead>
<tr>
<th>Direct guidance</th>
<th>Adaptive link sorting</th>
<th>Adaptive link hiding</th>
<th>Adaptive link annotation</th>
<th>Adaptive link generation</th>
<th>Map adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possible, but tricky</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

New: Adaptive link destination technique

| Yes |
Design requirement
“adaptation types and techniques”

Authors tools
- Concept Editor
- Graph Author
- Form Editor

Java Applets

AHA! engine
Java servlets

Pages from external WWW servers

WWW server
- DM/AM
- local pages
- UM

End-user
DM - Domain Model
AM - Adaptation Model
UM - User Model

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Design Requirement
“Aspects Used for Adaptation”

- Domain model related information
- User related information (not related to DM)
- Environment data

Represented via domain model and “pseudo” concepts and multiple attributes of these concepts
Design Requirement
“Arbitrary Concept Relationships”

Graph Author templates:

• Concept templates
  - concept types (e.g., page, object, abstract)
  - arbitrary attributes

• Concept relationship types templates
  - requirements for concepts
  - event-condition-action rules updating the UM
Design Requirement
“Arbitrary Concept Relationships”

Examples of relationships:

Prerequisite
Concept B is a prerequisite for concept A
\( A. \text{suitability} : B. \text{knowledge} > 50 \)

Interest
Interest in concept B indicates interest in concept A
\( A. \text{suitability} : B. \text{interest} > 50 \)
Design requirements
“aspects used for adaptation” & “arbitrary concept relationships”
Design Requirement
“Generic Adaptation Rules”

• Rules tied to “generic” concepts
• Defined through the Graph Author concept relationship types templates
• Examples of “generic” concepts:
  Child-parent
  Source-destination
AHA! Graph Author Tool: Defining the Domain/Adaptation Model
Design requirement
“generic adaptation rules”
Design Requirement “Handling Non-monotonic User Model Updates and Cycles in Adaptation Rules”

Handling Non-monotonic User Model Updates

- Possibility to specify rules increasing/decreasing the attribute values of concepts

Handling Cycles

- By making the order of rules execution visible in the Concept Editor tool
- By an automatic check for cycles in the authoring tools
- By limiting the number of objects included in a page

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Design requirement
“handling cycles”

Design requirement
“non-monotonic UM updates”
Design Wishes

• Authoring Tools
  – high-level Graph Author
  – low-level Concept Editor

• Performance
  – AHA! achieves sub-second response time
The Authoring Process

- Defining domain/adaptation model
- Defining strategies (not required step)
- Creating application pages
Types of Adaptation Strategies

• **Instructional strategies**
  - selection of items
  - ordering information or
    providing different navigation paths

• **Instructional meta-strategies** – inference or
  monitoring strategies, to detect user’s learning
  style,
  e.g. preferences for:
  - certain types of information (e.g., text vs. image)
  - reading order (e.g., breadth-first vs. depth-first)
Problems and difficulties of AHS

• “Unstable” interface
• Privacy issues
• Difficulty of the authoring process
Conclusion

• We showed that it is possible to create a general-purpose AH tool

• We demonstrated the general-purpose nature of AHA!:
  – support for CS/LS implemented as an extension to the created tool, no changes to the core engine were required
  – eShop application created using the standard AHA! features
AHA! Tutorial Showing Learning Styles Application
Presentation for Imager+Global Learner

Adaptation performed by AHA!

Adaptation in AHA!

Adaptive presentation (content level adaptation)

Conditional inclusion of fragments

- requirement for fragment
  - fulfilled
    - fragment included
  - not fulfilled
    - fragment not included

Adaptive navigation (link level adaptation)

Link hiding or annotation

- depends on
  - "desirability" of a page
    - defines
      - link colors
        - good
        - neutral
        - bad
Adaptation performed by AHA!

- Regarding the content level adaptation fragments can have an associated requirement. This is a Boolean expression that decides whether the fragment should be included or not. In AHA! a fragment can be a part of an html or xhtml page. In that case the requirement is also part of the page, using an <if> tag. A fragment can also be an object, stored in a separate file. In that case the requirement is stored inside the combined domain and adaptation model, and the inclusion also triggers the adaptation engine to perform more user model updates.

- Regarding the link level adaptation AHA! checks a condition associated with the destination of a link in order to decide whether the link is "desirable". Depending on the status of the link destination the link anchor will be of the class 'good", "neutral" or "bad". By default this results in the link anchor being blue, purple or black.
Inferring Preferences for Image or Text
Writing Applets Example
Writing Applets

- AppletActivity
- AppletExample
- AppletExplanation
- AppletTheory

Unknown user (no email address) has read 1 page and still has 4 pages to read - list of read pages - pages still to be read
Changeable settings: link colors - knowledge of unknown title - password - Log off

Writing Applets

Directly or indirectly, this trail covers everything you need to know to write a Java applet. Because applets can use almost all of the Java API, this trail mentions many features that are explained elsewhere. Feel free to cross over to other trails to learn about the features that interest you. Once you're ready to write an applet, you can return to this trail to find out how the applet environment affects the features you want to use.

Note: This trail has not been converted to Swing. How to Make Applets in the Swing trail covers Swing applets in depth.

Overview of Applets tells you how applets work. You should thoroughly understand this lesson before going further in this trail.
Presentation for Reflective Learner

Writing Applets

- AppletExample
- AppletActivity
- AppletExplanation
- AppletTheory

Unchanged settings: link colors - knowledge of unknown title - password - Log off

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Adaptive eShop Application
Where innovation starts

Miscellaneous Software

MobileMe Single User

Misschien heb je een Mac thuis, een pc op het werk en een iPhone of iPod touch. Hoe hou je alles synchroon? Met MobileMe. Daarmee zijn je e-mails, contacten en agenda altijd up-to-date, ongeacht waar ze bekijkt en op welk apparaat. MobileMe is compatibel met de programma's die je goed kent. Microsoft Outlook op een pc. Mail, Adresboek en iCal op een Mac. Veranderingen die je in deze desktopprogramma's doorvoert, worden via MobileMe regelmatig gesynchroniseerd. Beheer je mail, contacten, agenda, foto's en bestanden op me.com. Alles met indrukwekkende webapplicaties die zoveel functionaliteit bevatten en zo gebruikersvriendelijk zijn dat je ze misschien zelfs liever gebruikt dan je desktopprogramma's. Specifications...

InfoPath 2007 Win32 English AE CD Academic Box

Office InfoPath 2007 combines the familiar Microsoft Office system environment with Microsoft Office InfoPath Forms Services to deliver effective business forms solutions to your organization. Office InfoPath 2007 helps organizations efficiently structure and manage forms-driven business processes.

Extend the Reach of Your Business Processes

InfoPath e-mail forms and Office InfoPath Forms Services extend the reach of your business processes to familiar programs and platforms using forms as e-mail messages, Web browser forms, or forms for mobile devices.

Specifications...
Purchase

MobileMe Single User

Enter the number of items you would like to purchase 1

Submit Reset

Miscellaneous Software

MobileMe Single User

InfoPath 2007 Win32 English AE CD Academic Box

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Database Software

Jam Pack Symphony Orch Ret v1/EN CD XP

With the newest member of the Jam Pack family you can conduct your own orchestra with new sounds for GarageBand, Logic, and Soundtrack. Create lush symphonic music with this collection of software instruments and loops, including strings, brass, woodwinds, percussion, piano, and more. From classical compositions to Hollywood-style scores to rock and hip-hop textures, with Jam Pack: Symphony Orchestra, you are the conductor.

More information ...

Microsoft Gears of War PC Win32 EnglishInternational Not to Latam DVD DVD Case

"Gears of War" features the amazing tactical action and multiplayer excitement found in the critically acclaimed "Gears of War" for the Xbox 360 video game and entertainment system that sold more than 3.5 million units, and a variety of all-new content, including three new multiplayer maps, a new multiplayer game type, Game Editor, five new campaign chapters and DirectX 10 support.

"Gears of War" thrusts gamers into a deep and harrowing story of humankind's epic battle for survival against the Locust Horde, a nightmarish race of creatures that surface from the bowels of the...

More information ...