INFSCI 2480
Adaptive Presentation

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With slides of Worasit Choochaiwattana, INFSCI 3954 The Adaptive Web

Adaptive presentation: goals

- Provide the different content for users with different knowledge, goals, background
- Provide additional material for some categories of users
  - comparisons
  - extra explanations
  - Details
- Remove irrelevant or already known content

Adaptive Presentation: Content Selection

AP: Comparisons in PEBA-II

The Echidna

The Echidna, also known as the spiny Anteater, is a type of Monotreme that is covered in stiff, sharp spines mixed with long, coarse hairs.

The Echidna has the following subtypes:

- the short-beaked Echidna and
- the long-beaked Echidna.

The Echidna is about the same length as a domestic cat. It ranges from 2 kg to 7 kg in weight. It has a browny black coat and paler-coloured spines. It has a small head. It has a prolonged, slender snout. It has no teeth. It uses its extensible, sticky tongue for catching ants, termites and other small insects. It is a carnivore and eats ants, termites and earthworms. It has powerful claws allowing for rapid digging of hard ground. It is found in Australia. It is active at dawn and dusk. It lives by itself. It has an average lifespan in captivity of 50 years.

This text is generated for the novice user level. If you would like the text for the expert user level click here.

AP: Comparisons in PEBA-II

The Echidna

The Echidna, also known as the spiny Anteater, is a type of Monotreme that is covered in stiff, sharp spines mixed with long, coarse hairs. Although it is similar in appearance to the African Porcupine it is not closely related. The African Porcupine is a type of Rodent that has long sharp spines, up to 50cm long, which cover its whole back and can be raised by muscles under the skin. Like the African Porcupine, the Echidna has a browny black coat and paler-coloured spines. The African Porcupine is twice the length of the Echidna (80.0 cm vs 47.5 cm). The Echidna has an average weight of 4.5 kg whereas the African Porcupine has an average weight of 25.0 kg. The Echidna is a carnivore and eats ants, termites and earthworms whereas the African Porcupine is a herbivore and eats leaves, roots and fruit.

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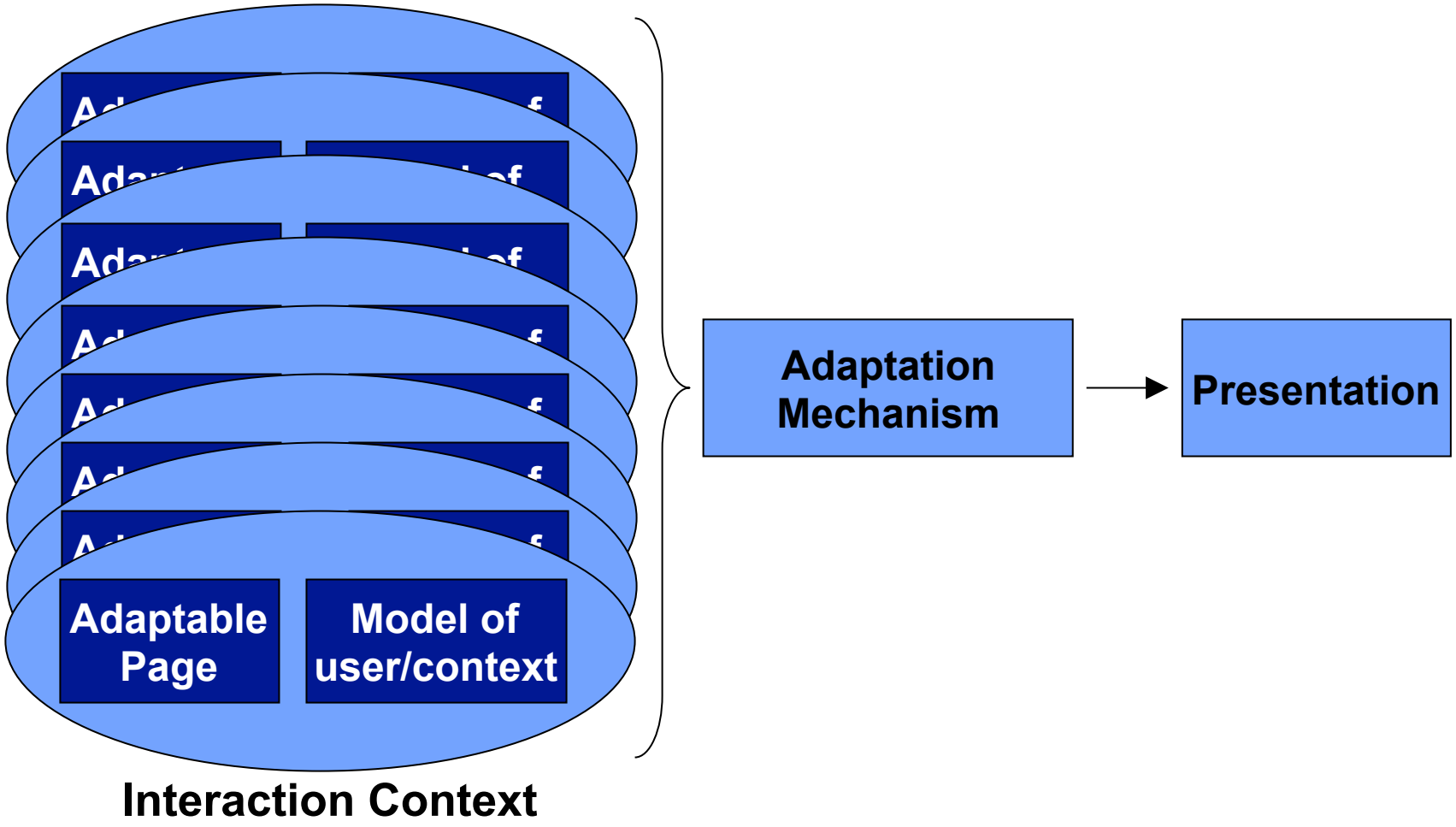
Layered View to Adaptive Presentation

- Content adaptation
  - What to present?
  - Select relevant content for presentation
- Adaptive presentation
  - How to present?
  - Select presentation approaches for selected content

Techniques for Content Adaptation

- Using *canned text*
  - Page and Fragment Variants
- Content generation from various internal representations
  - Approaches Based on Abstract Information

Page and Fragment Variants



Page Variants

- Simplest approach for content adaptation
  - Several variants are stored for the same content page
  - Each variant is marked as suitable for specific categories of users
  - One of the variants is selected dynamically to match the given user
- Example
  - Adaptive help in ORIMUHS
- Problems
  - Does not scale up to complex adaptation
  - Large number of variants need to be written

Fragment Variants

- The page presented to the user is constructed by selecting and combining an appropriate set of fragments.
- Each fragment typically is a self-contained information element, such as a paragraph or a picture
- Each fragment can be either presented or not presented to a specific user
- The level of granularity of the adaptation is increased.

Optional Fragments

- In *optional fragments*, a page is specified as a set of fragments; each fragment is associated with a set of applicability conditions
- At runtime, the page is generated by selecting only those fragments whose conditions are satisfied in the current interaction context.

Why Optional Fragments?

- Adding extra features for specific users
  - Additional explanations (MetaDoc)
  - Additional comparisons (PEBA-II)
  - Additional details
- Removing fragments, which are irrelevant
  - Do not match the current goal (PUSH)
  - Already well-known (ILEX)

Altering Fragments

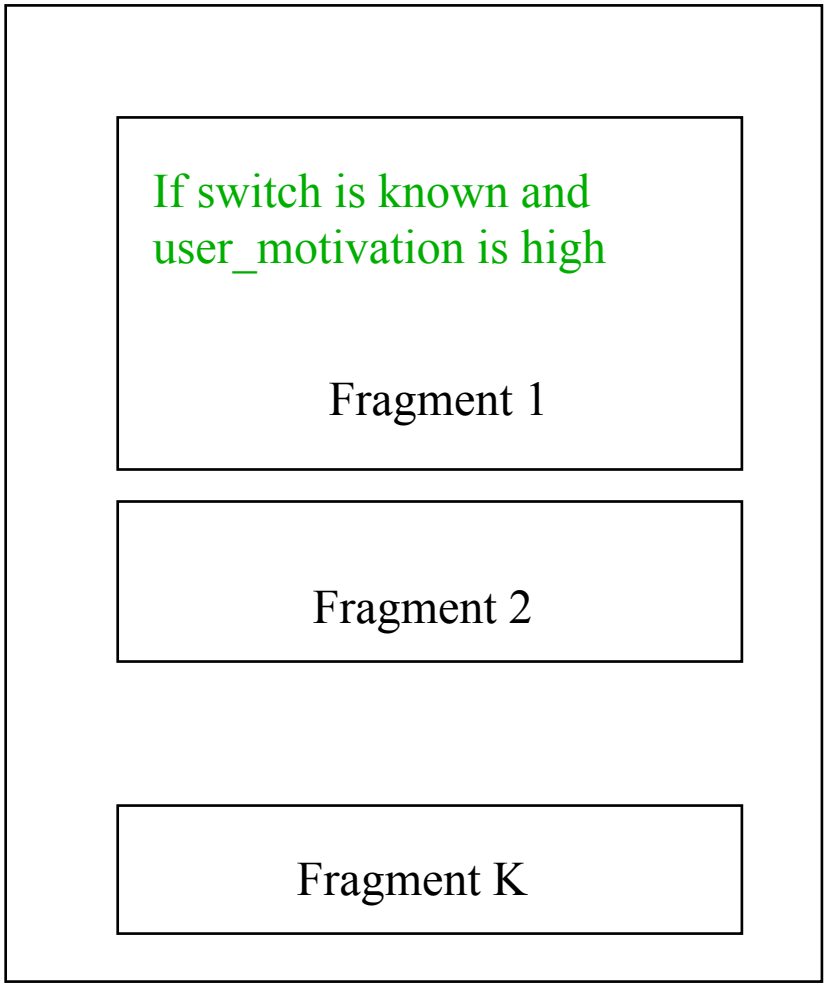
- In *altering fragments*, a page is specified as a set of constituents, and for each constituents there is a corresponding set of fragments.
- At runtime, the page is created by selecting for each constituent the fragment that is most appropriate in the current interaction context.

Fragment Variants

- Benefits
  - Once a set of fragments and conditions on their applicability have been written, a large number of pages can be automatically generated to cover a corresponding large number of situations.
- Problems
  - The selection and assembly of a suitable set of fragments may involve a substantial overhead at runtime.
  - It may be sometimes difficult to combine the set of independently selected fragments into a coherent whole (smoothing approaches using NLG - see Hirst)

Conditional Text Filtering

- Similar to UNIX cpp
- Universal technology
  - Altering fragments
  - Extra explanation
  - Extra details
  - Comparisons
- Low level technology
  - Text programming



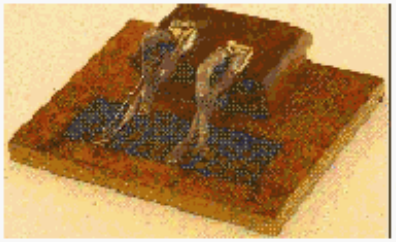
Content Generation

- It requires an abstract representation of the domain from which the content is selected, as well as of the features of the interaction context to which the content is tailored.
- Several formalisms have been used to represent the domain and the context (user models)
  - Knowledge Bases : ILEX, HYLITE+
  - Bayesian Networks : NAG
  - Preference Models : GEA, PRACMA, SETA

Adaptive Presentation from "Abstract Information"

- Content Selection/Determination
  - A subset of the domain knowledge is identified.
    - most domain-independent strategies for content selection compute a measure of relevance for each content element and use this measure to select an appropriate subset of the available content
- Content Structuring
  - Selected fragments are organized in order to be effectively communicated/presented.
    - This involves not only ordering and grouping them, but also specifying discourse relations between fragments

ILEX Content Selection



Pair of brooches on mount

Silver, gold, mahogany, walnut and perspex

This item was made in 1979 and is made of silver, gold, mahogany, walnut and perspex. It was designed by Martin Page who was English. Like the necklace designed by Flockinger, this item is in the Organic style. Organic jewels tend to be coarsely textured. However, this item has smooth surfaces.

With a piece like this, the boundary between `jewellery' and `sculpture' or `art' starts to become quite indistinct. One important theme across 20th Century jewellery has been what to do with a piece of jewellery when it is not being worn. From the 1970s onwards, jewellers have started exploring the idea of turning jewellery into sculpture--so that you can hang it on the wall, or prop it on the mantelpiece when you are not wearing it. This piece works equally well whether it is being worn or being displayed (as at present).

Other jewels in the organic style include:

- a pendant necklace designed by Bjorn Weckstrom
- the necklace designed by Flockinger
- a bracelet designed by Flockinger
- a finger ring designed by Frances Beck
- a finger ring designed by Jacqueline Mina
- the previous item
- a finger ring designed by Ernest Blyth

ILEX Content Selection

- The content selection strategy is to return the n most relevant knowledge elements.
  - If the selection process based on relevance cannot fine a sufficient number of knowledge elements, additional content selection routines are activated.
- The measure of relevance for content selection combines a measure of *structural relevance* of knowledge element/fact with its *intrinsic score*.

ILEX Content Selection

- Structural relevance is computed starting form the focal entity using two heuristics
  1. Information becomes less relevant the more distant it is from the focal object, in term of semantic links
  2. Different semantic links maintain relevance to different degrees.
- Intrinsic score of a knowledge element combines numerical estimates of three factors
  1. The potential interest of the information to the current user
  2. The importance of the information to the system's informational goals
  3. The importance of the information given to what extent the user may already know this information

ILEX: Interest Adaptation

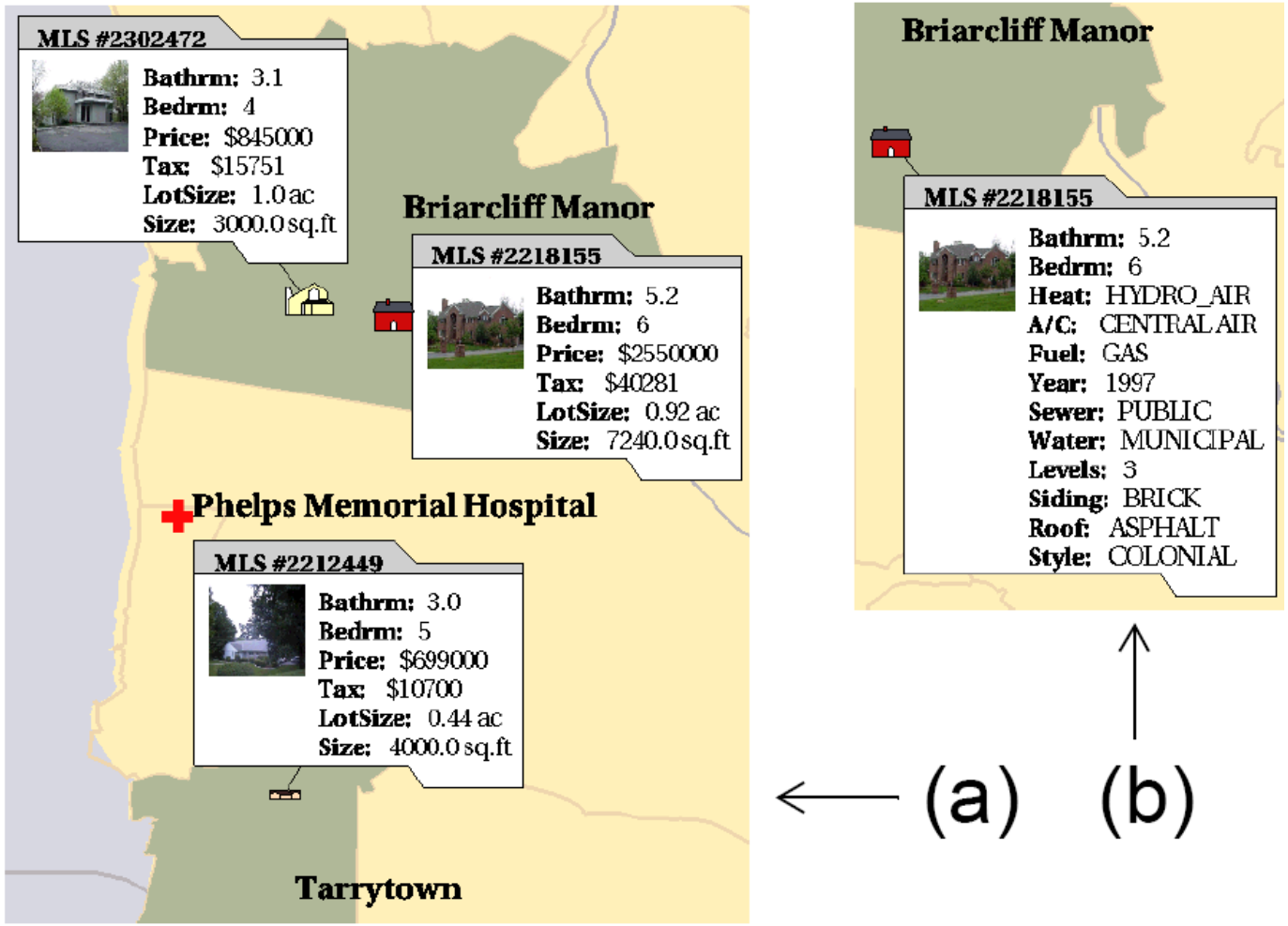
- for a user interested in styles
- This jewel is a necklace and is in the Organic style. It was made in 1976. It is made from opals, diamonds and pearls. Organic style jewels usually draw on natural themes for inspiration (for instance, this jewel uses natural pearls). Organic style jewels are usually encrusted with jewels. To take an example, this jewel has silver links encrusted asymmetrically with pearls and diamonds.

- for a user interested in designers
- This jewel is a necklace and was made by Gerda Flockinger, who was a designer and was English. The jewel, which is in the Organic style, was made in 1976. Organic style jewels usually draw on natural themes for inspiration; for instance, this jewel uses natural pearls. Organic style jewels are usually encrusted with jewels; for instance, this jewel has silver links encrusted asymmetrically with pearls and diamonds.

Example: RIA

- RIA (Responsive Information Architect)
- Multimedia conversation system (real estate recommendation)
- Multimedia response to a user query (speech or gesture) is tailored to conversation context
- Automatic response generation – optimization-based
- Content selection – balancing constraints (content quality & quantity constraints)

RIA Multimedia Response



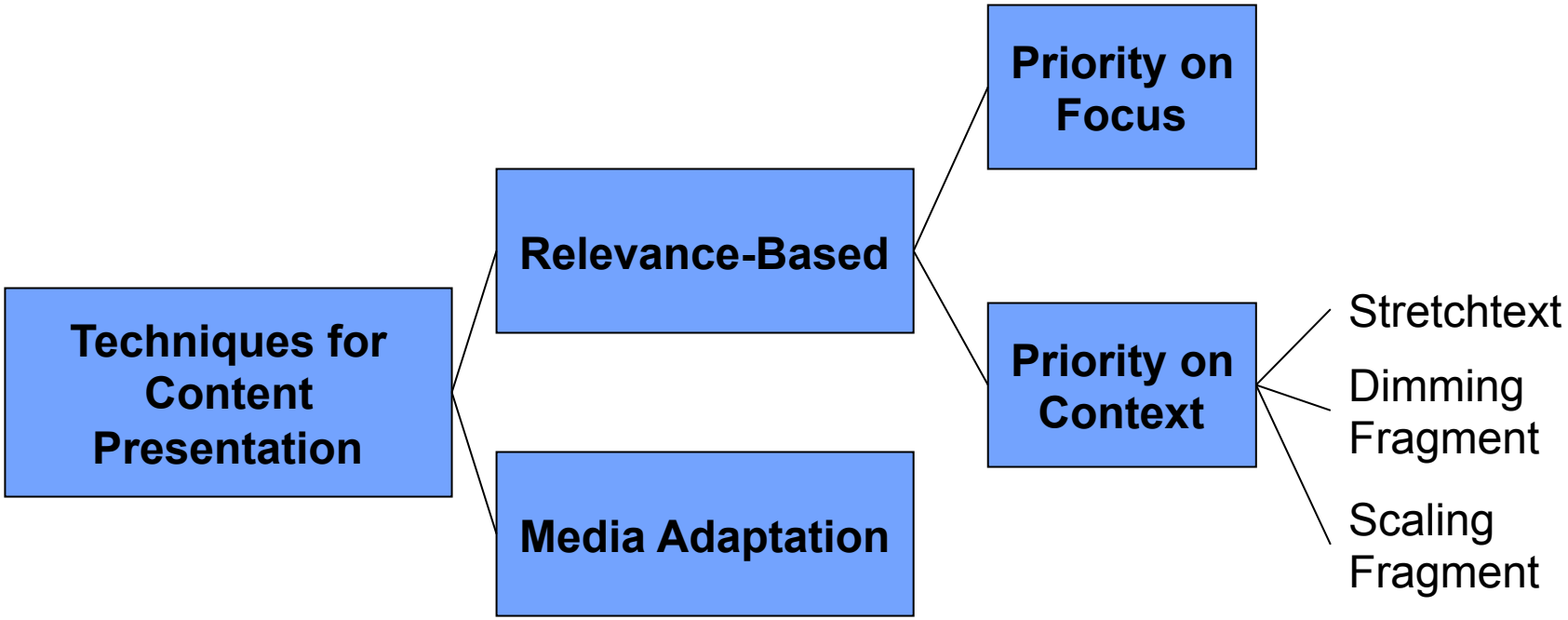
RIA: Content selection as an optimization problem.

- The goal is to identify the most desirable subset of data dimensions in the current interaction context.
- The desirability of each data dimension is computed as the linear combination of a large set of feature-based metrics that characterize how important the dimension is with respect to the interaction context.
- Most of these feature are labeled as content relevance features and include features of the data, features of user, as well as features relating the dimension to the user request and the interaction history.
- Once data dimensions have been assigned their desirability, RIA's content selection strategy returns the set of data dimensions such that their overall desirability is maximized and their cost is within given space and time allocated for the target presentation.

Content Structuring

- This involves not only ordering and grouping them, but also specifying what discourse relation must hold between the resulting groups
- Schemas are the method of choice to accomplish all these tasks and are commonly implemented with task-decomposition planner

Techniques for Content Presentation



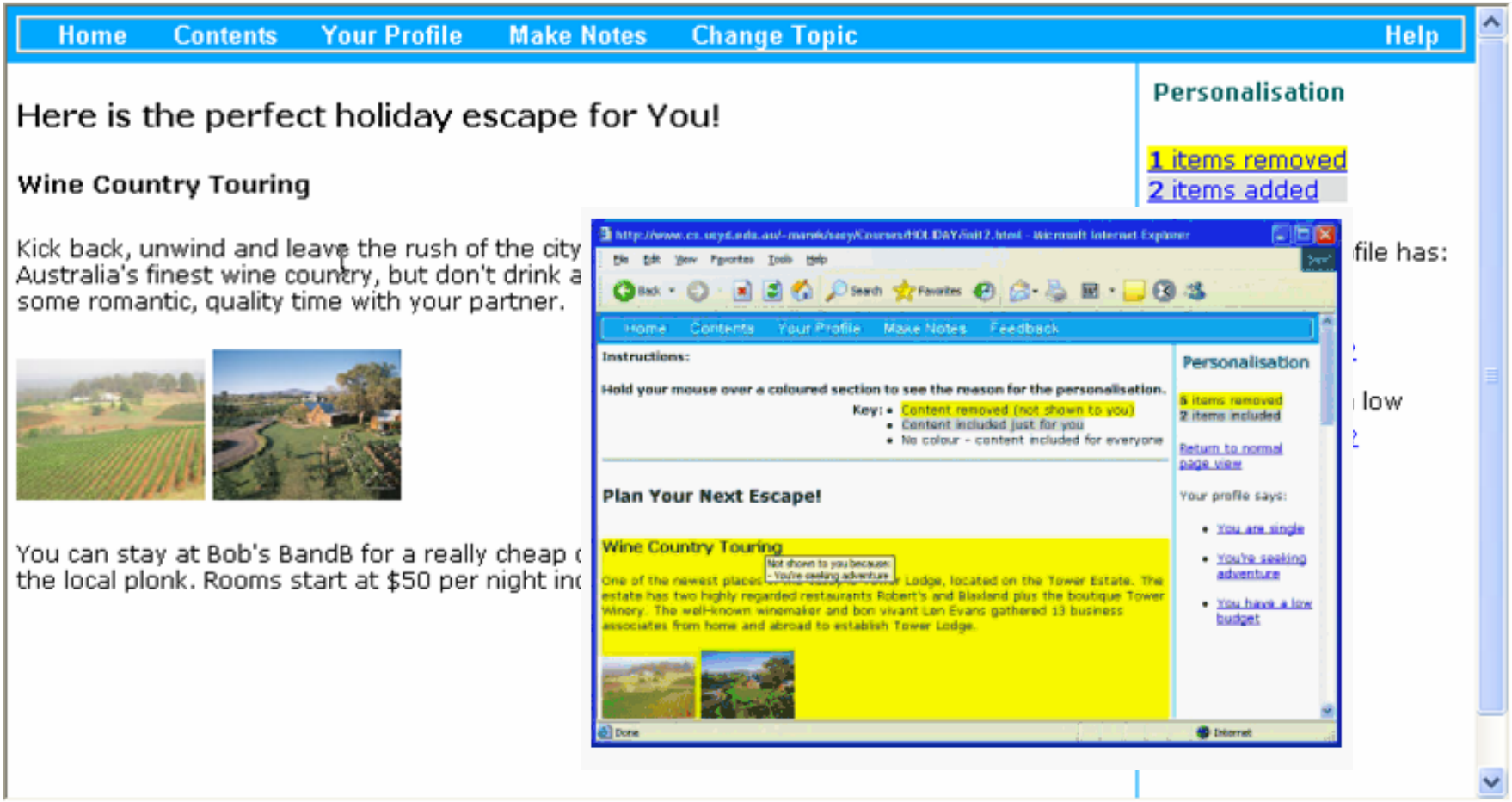
Relevance-Based Techniques

- Two general dimension
  - Maintaining Focus
  - Maintaining Context
- Context is more easily maintained if much of the original content is visible to the user.
- The more context is shown, the higher the chances of generating information overload and reducing attention to the most relevant information.

Priority on Focus

- All of the techniques in this category choose to maximize focus by
  - Showing only the most relevant content
  - Precluding access to the rest of the context.
- The two main drawbacks:
  - The user has no way to recover from bad adaptation
  - They do not allow for user control
  - *Scrutability* interface may ease this drawback

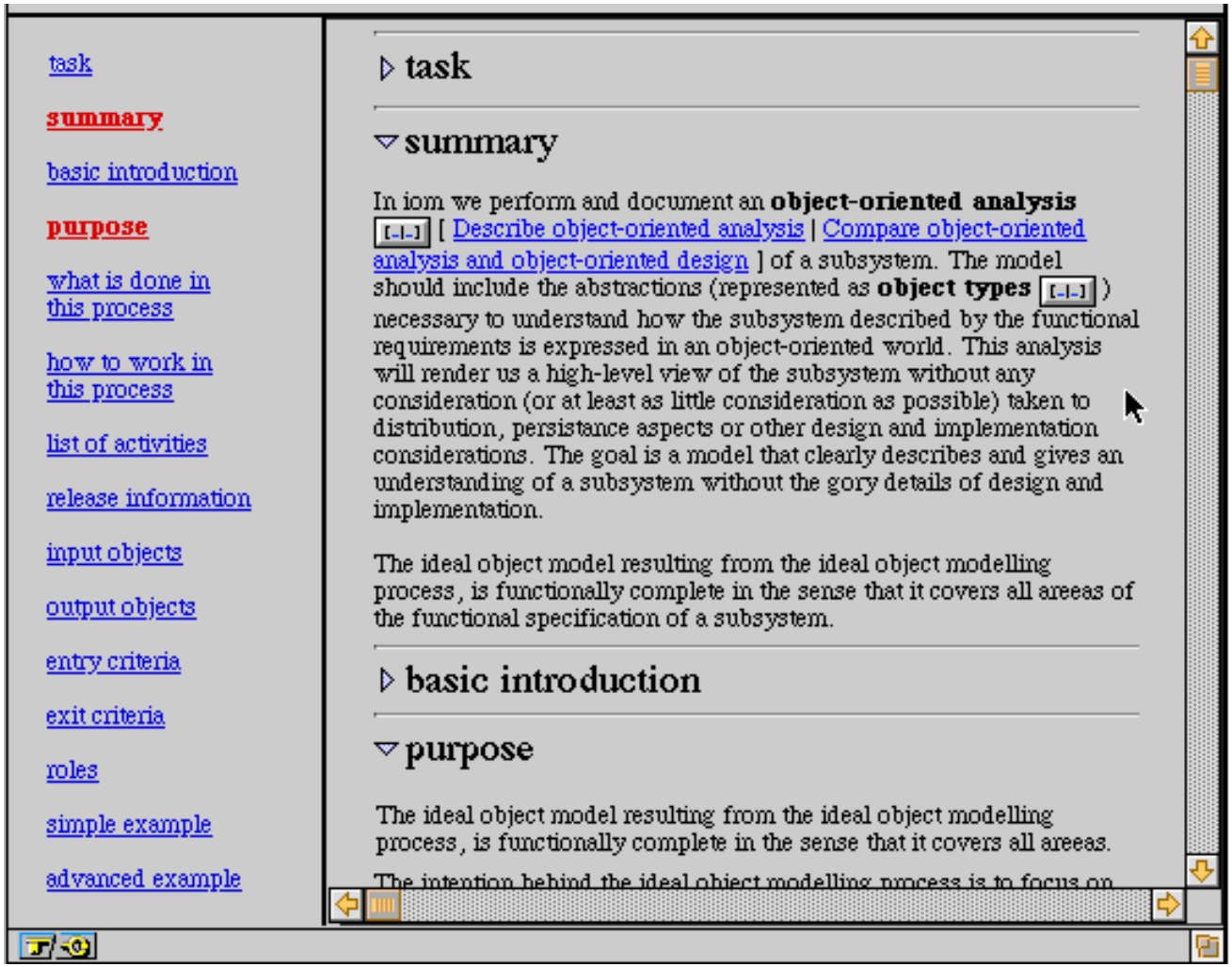
Scrutable Adaptive Presentation in SASY



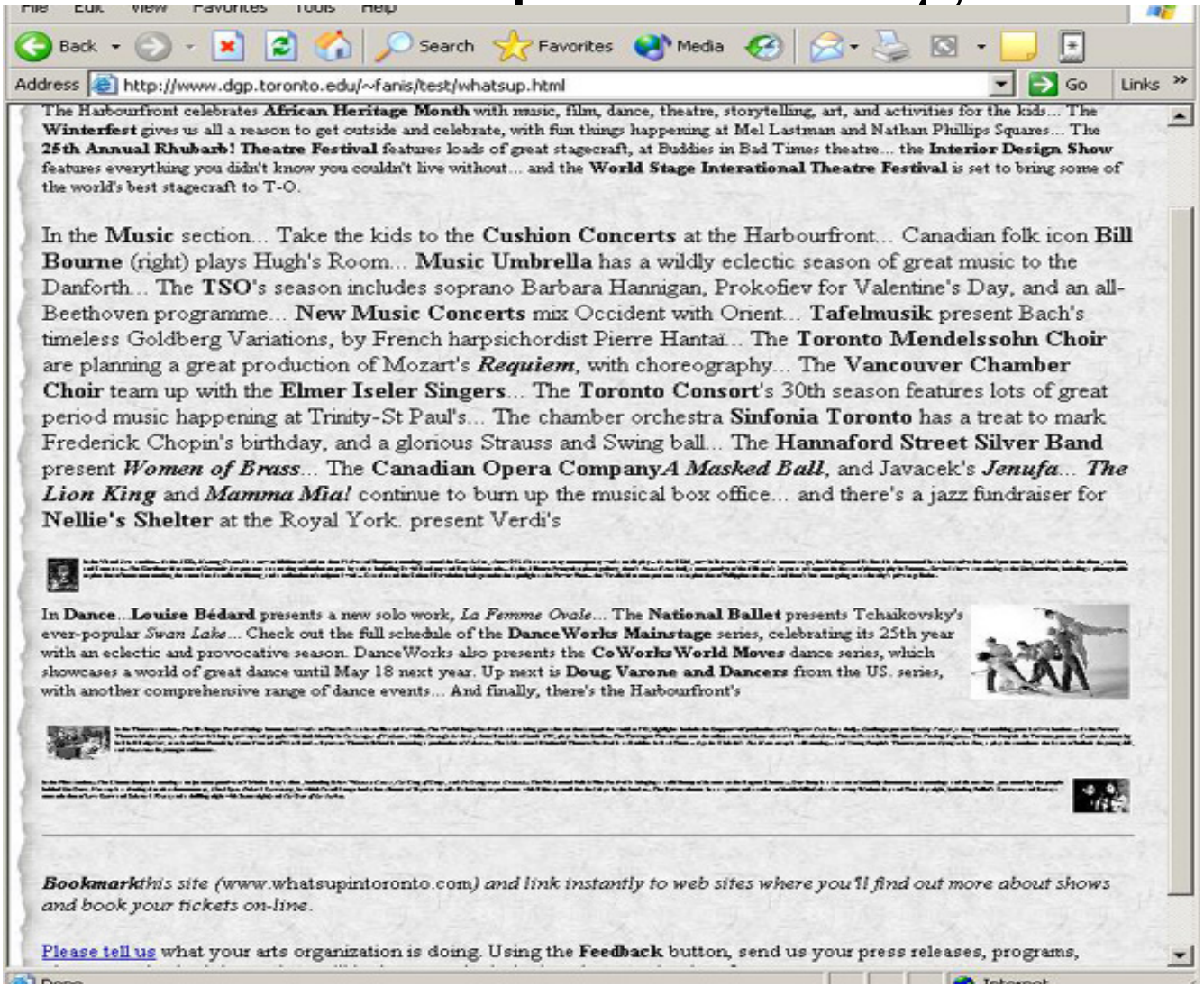
Priority on Context

- Stretchtext
  - Preserve focus by hiding the less relevant content.
- Dimming Fragments
  - Deemphasize content by fading its color
- Scaling Fragments (AKA Fisheye)
  - Deemphasize content by reducing size

Example: Stretchtext (PUSH)



Example: Scaling



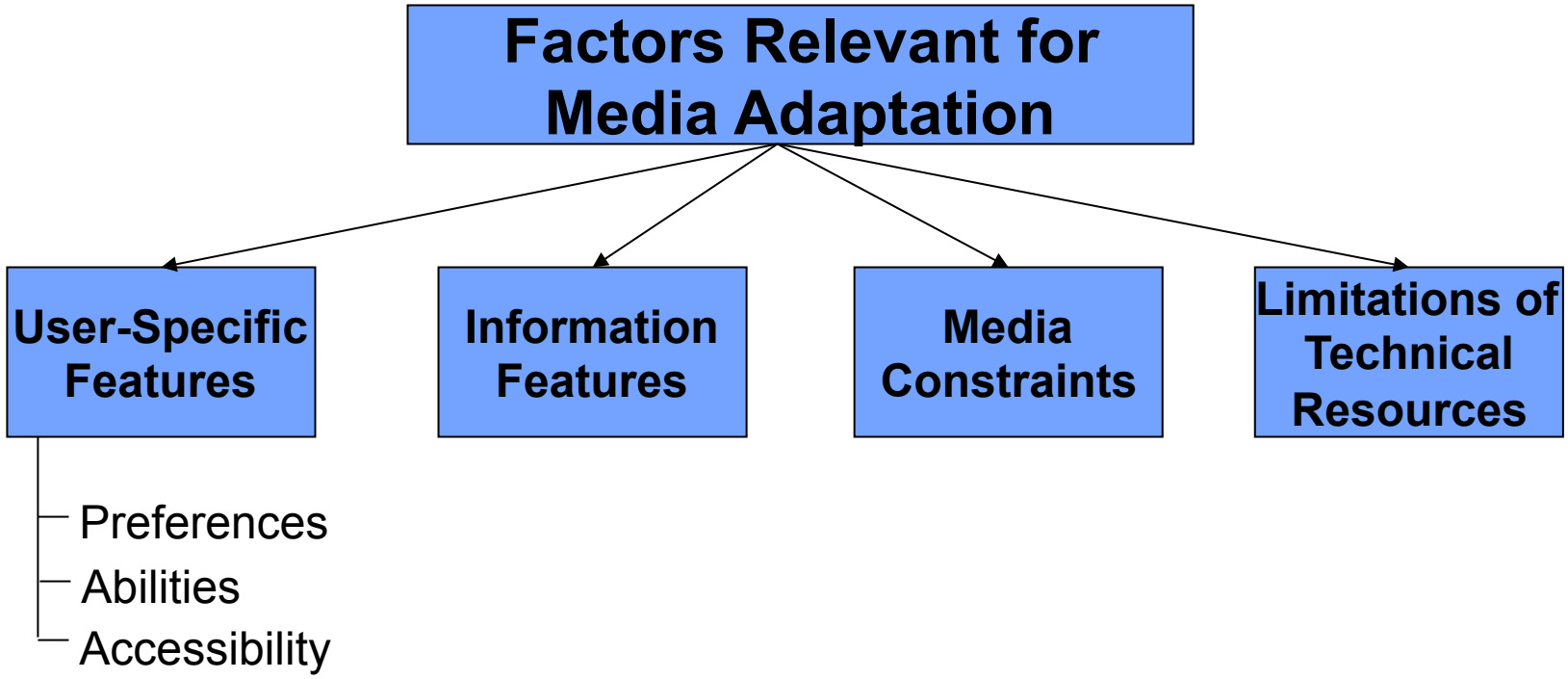
Scaling vs. Stretchtext

- Tsandilas and Schraefel pointed out that
  - Stretchtext performed better on larger pages.
  - 4 of 6 subjects gave a higher score to scaling because they felt it provides better information on the content of the deemphasized paragraphs.
- For more details, http://wwwis.win.tue.nl/ah2003/proceedings/ht-5/

Technique for Media Adaptation

- Adapting the medium (e.g. text, graphic, spoken language)
  - Factors Relevant for Media Adaptation
  - Example of System
- Media Adaptation Approaches
  - Rule-base approach
  - Optimization approach

Factors Relevant for Media Adaptation



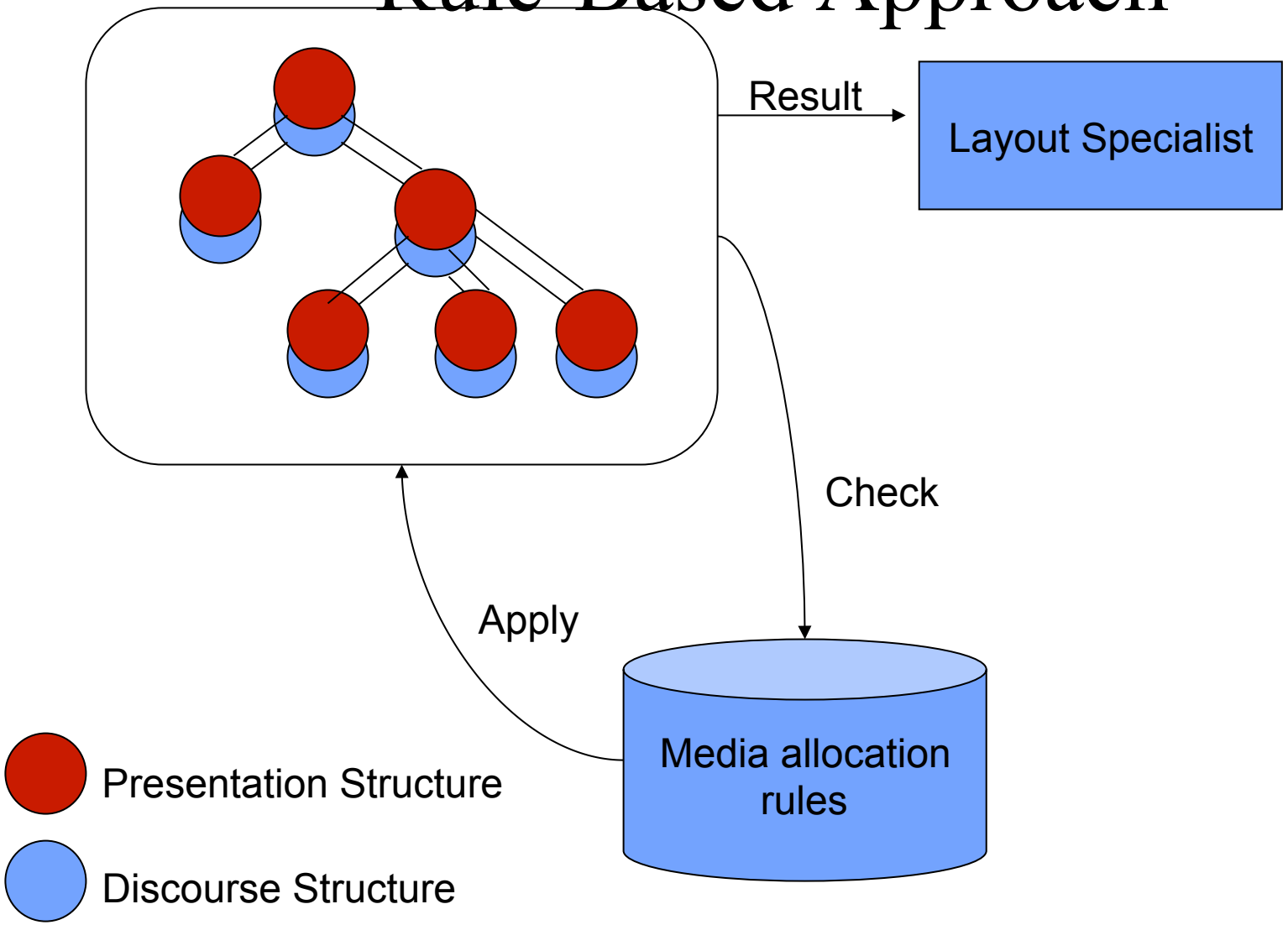
Example of System

- The CUMAPH adaptive hypermedia environment adapts hypermedia documents according to user profile that describes the user's cognitive abilities.
- The AVANTI system adapts the media according accessibility issues and resources issues.
- For more details, http://www.contrib.andrew.cmu.edu/~plb/UM97_workshop/Fink/Fink.html

Rule-Based Approach

- The vast majority of systems that perform media adaptation are using rules that describe how to best convey the target information given subsets of the factors.
- Arens et al. describe a system that can adapt the media based on characteristics of the information to be conveyed, media constraints, the user's interests and abilities, and the overall goals of the information presentation.

Rule-Based Approach



References

- ***Adaptive Presentation for the Web*** by Andrea Bunt, Giuseppe Carenini and Cristina Conati
- ***Adaptive Presentation Supporting Focus and Context*** by Theophanis Tsandilas and m.c. Schraefel
- ***Personalised hypermedia presentation techniques for improving online customer relationships*** by Alfred Kobsa, Jurgen Koenemann and Wolfgang Pohl.