Web Engineering

Chapter 3: The Web – An Information System

Audio – Reception, Play-back

- large amount of data
  - 1 Minute ~ 10MB raw (44.1kHz * 2 Byte * 60 s * 2)
    (frequency * bit-depth * time * channels)
  - long download times

- optimizing the file size
  - length of the audio clip
  - number of channels
  - bit-depth
  - sampling rate

- Play-back during reception, buffering

- Streaming Formats
  - Alternative formats, e.g. RealAudio, Quicktime Audio

Streaming, e.g. RealAudio

- link:
  `<A HREF="musik.ram"> here you get live music!</a>

- SML – selection of bandwidth
  Synchronized Multimedia Integration Language

- meta file: musik.ram
  `pnm://129.13.170.22/live/musik.ra`

- data transmission
  - UDP
  - back-channel, scalability

[Link to samples](http://www.realnetworks.com/devzone/howto/contentcreation/smiltips/samples/)
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Collections

- set (without order)
- classification based on criteria defined implicitly by the collector
- often restricted to a certain domain
- motivation
  - Complete or representative acquisition within a limited domain

Systematic Approaches

- Collect and Summarize
  - Collection

- Indexing
  - Catalog
  - Library

- Connections based on Content
  - Hypertext

Index, Catalog

- Indexed information
- explicit classification based on categories or according to keywords
- motivation
  - classification of information across different domains
- examples
  - Encyclopedia
### Connections based on Content

- Using links/relations between the content of information chunks
- Direct association instead of indirect association according to a classification
- Similar to concept maps
- „Like humans organize their knowledge“

### Linear Structures I

- Pure linear
- Strict guidance (directed)
- Little choices for the user
- Pre-caching possible

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### Structuring Information

- Linear
- Hierarchical
- Grid
- Graph/web
Linear Structures II

- pure linear
- strict guidance
- little choices for the user
- pre-caching possible

Linear Structures III

- linear with options
- guidance
- some choices for the user
  - active interaction
- scenarios: questionnaires

Linear Structures IV

- linear with alternatives
- guidance
- some choices for the user
- active interaction
- scenarios: questionnaires

Linear Structures V

- linear with side branches
- additional information on side path
- guidance on main path
Circular Structure
- closed guided path
- variants / side paths
- entry
- E.g. Web Rings
  http://dir.webring.yahoo.com

Information Grid
- ordered on two orthogonal criteria
- user get a “feeling of space”
- e.g. product catalog
- possible for more dimensions

Example
Grid Information Structure I
- catalog
  2 dimensions
- screws
- nut
- discs
- Manufacturer A
- Manufacturer B
- Manufacturer C

Example
Grid Information Structure II
- catalog
  3 dimensions
- screws
- nut
- discs
Hierarchical Information Structure

- deep hierarchy
  - Lookup table (A-Z)
  - 6-10 is reasonable (cognitive psychology)
- flat hierarchy

Linked Information Structures

- pure webs
- difficult for orientation
- extremely expressive

Information Mapping

- information mapping
  - mapping of information onto an abstract structure
  - mapping the structure to web pages
- Trade Offs
  - expressive vs. pre-defined structure
  - guidance vs. confusion

Organizing Information in the WWW

- based on a open hypertext system
- information can be organized in any way
  - partly „real“ hypertext with links based on content
  - partly indexed documents and catalogs
  - Partly simple collections of resources
- information is structured very differently
  - often mixture of linear and hierarchical structure
  - hypertext links are often not associative, but just to build a linear hierarchical navigation structure
    - previous/next
    - up/down/home
Hypertext

- components
- classification
- reference model
- practical design

Roots of Hypertext

- "Memex"
  - Vannevar Bush: "As we may think", 1945
  - "Memory Expander"-Machine
  - associative storage/access
  - personal annotation linked to documents

- Xanadu
  - term Hypertext
  - Docuverse: global hypertext system, Pay per View

- Augment/NLS (oNLine System)
  - Douglas Englebart, 1968
  - Shared Hypertext Document Spaces

Hypertext

- concept to organize information

- motivation
  - "knowledge" is not linear, it is associative
  - authoring a document = making knowledge linear
  - reading a document = reproduce the non-linear structure of the knowledge ➔ navigation

➔ hypertext-documents:
  - keep the inherent association of information in a document

Hypertext – Example I
Hypertext – Example II

Hypertext Components

- **structure**
  - hypertext document: directed graph

- **components**
  - node: information unit
  - anchor: Information chunk within a node, target for a link
  - link: connections between nodes

Node

- **single media nodes**
  - only one media type per node

- **mixed media nodes**
  - different media types possible per node
  - alternatives, combination

- **systems with limited content size**
  - no internal navigation
  - e.g. HyperCard

- **systems with unlimited content size**
  - internal navigation necessary
  - e.g. Scrolling

Anchor

- **types of anchors**
  - source anchor
  - target anchor

- **represented as**
  - button
  - icon
  - text (e.g. Underlined)
  - hidden
  - animation (e.g. mouse over)
  - ...

- **representation of source anchors as link**

- **representation of target anchors is often hidden**
**Links**

- simple (un-typed) links
- typed links
  - e.g. Categoryised according to semantic or type of target

**Target and Direction of Links**

- target of a link
  - referencing an external document
    - e.g. quotation
  - inline link
    - e.g. embedded image
    - transclusion
  - link as annotation
    - link additional information
  - calculated link
    - target dependent on state (e.g. time, profile)

- direction of links
  - uni-directional links
  - bi-directional links

**Semantics of Links**

- relation between source and target
  - is part of ...
  - represents ...
  - effects ...
  - needs ...
  - is needed by ...
  - owns ...
  - includes ...
  - is similar to ...
  - ...

**Classification of Hypertext Systems**

- Hypertext System 1st order
  - nodes
  - anchor inside nodes
  - links between anchors
  - standard attributes for nodes, anchors and links

- Hypertext System 2nd order
  - user defined note types
  - user defined link types
  - user defined attributes

- Hypertext System 3rd order
  - abstract note and link structures
  - representation and manipulation of note and link semantics
Architecture of Hypertext Systems

- Dexter Hypertext Reference Model [Halasz und Schwartz 1994]
  - runtime and presentation layer
  - storage layer
  - within-component layer

PostIt-Method for the Structural Design

designing the navigational structure of large web site with non-technical staff and decision makers

Example: Organizing Information on the Web

- link lists
  - collection of links to similar / related information
  - arbitrary structure

- sitemap
  - visualizing the structure of a (large) web site
    - often grid, tree, or hierarchical structure

- webring
  - circular linked pages of similar content
  - easy access to related information
  - „distributed catalog“
    - ordered top-level navigation
    - see www.webring.org

Evolutionary Method

- „all on one table“ (authors, editors, programmer, designer, manager, decision maker, …)
- each participant (or teams of 2) make suggestions on paper for the following topics:
  - structure and scale of the web
  - navigation
  - basic design issues and interaction elements
  - technical realization

- short presentation of the ideas
  - up to 5min per participant (everyone the same time)
  - display the ideas on the wall or on a board
  - discussion and evaluation of aspects of the suggestions based on a checklist

- iteration
  - revision of the suggestions
  - border condition: 30% of the concept must be changes and taken from one of the others suggestions

Is the result acceptable and feasible?

No

Yes
detailed concept