Subject browsing

- seeking for information resources by examining a hierarchical tree of broader and narrower subject classes into which the resources have been classified
- browsing services
  - for academic users
    - e.g. Intute (http://www.intute.ac.uk/), Renardus (http://www.renardus.org),
  - commercial
    - e.g. Yahoo! directory (http://dir.yahoo.com/), Google Directory (http://www.google.com/dirhp)
- browsing vs. searching
  - contradictory claims and research results

Structures for subject browsing

- traditional: classification schemes, thesauri, subject heading systems
- from the WWW: ontologies, search-engine directories
- some better for browsing than others
  - hierarchical structure
  - document collection
  - names of subjects

Renardus

- http://www.renardus.org
- integrated searching and browsing of ca. 80,000 resources from major European subject gateways
  - simple and advanced searching
  - browsing through Dewey Decimal Classification (DDC)
  - browsing support features

Research issues

- the balance between browsing, searching and mixed activities
- the degree of usage of the browsing support features
- typical sequences of user activities and transition probabilities in a session, esp. in traversing the hierarchical DDC browsing structure
- typical entry points and referring sites
Methodology

- log analysis
  - users do not need to be directly involved
  - catches unsupervised behaviour
  - every activity within the system tracked
  - cleaned and categorized entries (ca. 460,000) grouped into user sessions (ca. 73,000)
    - all entries from the same address
    - time gap between two entries less than 1 hour
    - one-entry sessions & sessions shorter than 2 seconds removed
  - sample
    - 16 months (2002/2003)

Main activities and transitions

Dominance of browsing

- 76% of all activities are browsing
  - majority start using Renardus at a browsing page because directly referred by a search engine
  - layout of Home page “invites” browsing
    - also users starting at Home page predominantly use browsing
  - good usage of browsing support features, esp.:
    - graphical overview
    - search entry to browsing pages
  - 5% of all activities are searching

Two types of users

- 71% people referred by search engines (mostly Google and Yahoo!)
  - 87% browsing, 2.7% searching
- 22% start at Home page
  - 57% browsing, 12.5% searching
  - more browsing activities per session than the other type
  - use non-browsing activities 3x (Other) and 5x (searching) as often
  - they use the service elaborately, in a way system designers intended

DDC browsing

- 60% of all activities
  - 2/3 are in unbroken browsing sequences
    - up to 86 steps
- keywords
  - good chance of finding browsing pages when using more than one search term

Major results

- given proper conditions, browsing is heavily used
  - browsing support features are also heavily used
- it is implied that DDC could serve as a good browsing structure, including terminology
Outline

- Subject browsing
  - Automated subject classification
  - Focused crawling
  - Demonstrators

Automated subject classification

- subject classification
  - grouping documents that have a property (topic, theme) in common, further sub-grouping of documents based on finer properties
  - establishing relationships between them

- automated subject classification
  - machine-based (statistical, NLP techniques)

- application at KnowLib
  - classification of Web pages for browsing
  - classification of Web pages for focused crawling

Approaches

- text categorization
- document clustering
- string matching

Text categorization

- machine learning
  - algorithms

- information retrieval
  - vector-space model
  - evaluation measures

- pre-defined browsing structures
  - learning about categories from pre-existing documents in the categories
  - for Web pages, search-engine directories

  e.g. http://search.thunderstone.com/texis/websearch/

Document clustering

- information retrieval
- vector-space model

- browsing structures automatically derived
  - clusters of similar documents and, partially, relationships between them
  - names of the clusters
  - such structures hard to understand
  - rather unstable as well

  e.g. http://www.kartoo.com/, http://www.clusty.com

String matching

- algorithms
  - usually string-to-string matching against a controlled vocabulary

- pre-defined browsing structures
  - controlled vocabularies
  - usu. classification schemes (good for browsing)

  e.g. http://engine-e.lub.lu.se/
**Automated classification issues**

- automating subject determination
  - logical positivism
    - subject is a string occurring a certain number of times, in a certain location etc.
    - if document 1 is about subject A, and if document 2 is similar to document 1, then document 2 is also about subject A
  - evaluation
    - issue of deriving the correct interpretation of a document's subject matter
    - few end-user evaluations

**Similarities between approaches**

- document pre-processing and indexing
  - removing stop-words
  - extracting relevant words
- utilization of Web-page characteristics
  - structural elements
  - metadata
  - text neighbouring headings and anchor text
  - text from linked pages
  - assumption: idea exchange beneficial

**Is there an exchange of ideas?**

- main research question
  - to what degree the three communities utilize others' ideas, methods, and findings
- direct links
  - do authors from one community cite authors from another
- indirect links
  - bibliographic coupling of papers
- sample
  - 148 papers: 52 ML, 63 IR, 33 LS

**Direct links**

- the ML community uses IR methods and both tended to cite each other to a certain extent
- few cases where LS authors were cited by either of the two other communities and the other way around

**Indirect links**

- what is the importance of distinguishing between different parts of a Web page?
  - title, headings, main text, metadata
  - what are the appropriate significance indicators?

  e.g. [http://froggy.lbl.gov/virtual/](http://froggy.lbl.gov/virtual/)

  ```html
  <title>Virtual Frog Dissection Kit Version 2.2</title>
  <meta name="description" content="Virtual Frog Dissection Kit"/>
  <meta name="keywords" content="frog dissection K-12 education"/>
  <h2>Virtual Frog Dissection Kit</h2>
  <h2>Frog watch</h2>
  main text:
  "This award-winning interactive program is part of the "Whole Frog" project. You can interactively dissect a (digitized) frog named Fluffy, and play the Virtual Frog Builder Game. The interactive Web pages are available in a number of languages...""
**Structural elements and metadata**

- **collection**
  - 1003 Web pages in engineering
- **Ei classification scheme**
  - 6 main classes
  - decimally subdivided
  - up to 5 hierarchical levels
  - 4 Civil Engineering
  - 44 Water and Waterworks Engineering
  - 441 Dams and Reservoirs
  - 445 Water Treatment
    - 445.1 Water Treatment Techniques
    - 445.1.1 Potable Water Treatment Techniques

**Approach**

- **algorithm:** string matching
  - when a match is found, the corresponding class is assigned, with a relevance score, based on:
    - which term is matched (single word, phrase, Boolean)
    - type of class matched (main or optional)
    - the part of the Web page in which the match is found
- **significance indicators**
  - derived using various measures of correctness
    - precision and recall
    - semantic distance
    - multiple regression

**Major results**

- title performs best, followed by headings, metadata, and text
- necessary to use all structural elements and metadata (not all of them occur on every Web page)
- how to combine them not important
  - the best combination was only 3% better than the worst one

**Near-future research**

- string-matching
  - termlist expansion (using NLP)
  - adjusting term weighting
  - adjusting cut-offs
- comparison between string-matching and SVM (text categorization)
  - 1) on a test collection, using standard precision and recall
  - 2) with users

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**Simple crawling**
Focused crawling in ALVIS

- Combine focused crawler
  - availability: http://combine.it.lth.se/
  - download, documentation, publications

- focused crawling in ALVIS:

- ALVIS: http://www.alvis.info

Outline

- Subject browsing
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Demonstrators

- http://www.it.lth.se/knowlib/demos.htm

- also, automatic vocabulary mapping
  - http://dbkit02.it.lth.se/exp/map/

Thank you for your attention