Hes·so // VALAIS WALLIS

Business Information Systems

Text-based (image) retrieval

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Overview

- Difference of words and features
  - Weightings instead of distance measures
- Stemming and pre-treatment
- Approaches for multilingual retrieval
- Tools available on the web
  - Lucene, …

Text retrieval (of images)

- Started in the early 1960s … for images 1970s
- Not the main focus of this talk
- Text retrieval is old!!
  - Many techniques in image retrieval are taken from this domain (sometimes reinvented)
- It becomes clear that the combination of visual and textual retrieval has biggest potential
  - Good text retrieval engines exist in Open Source

Problems with annotation (of images)

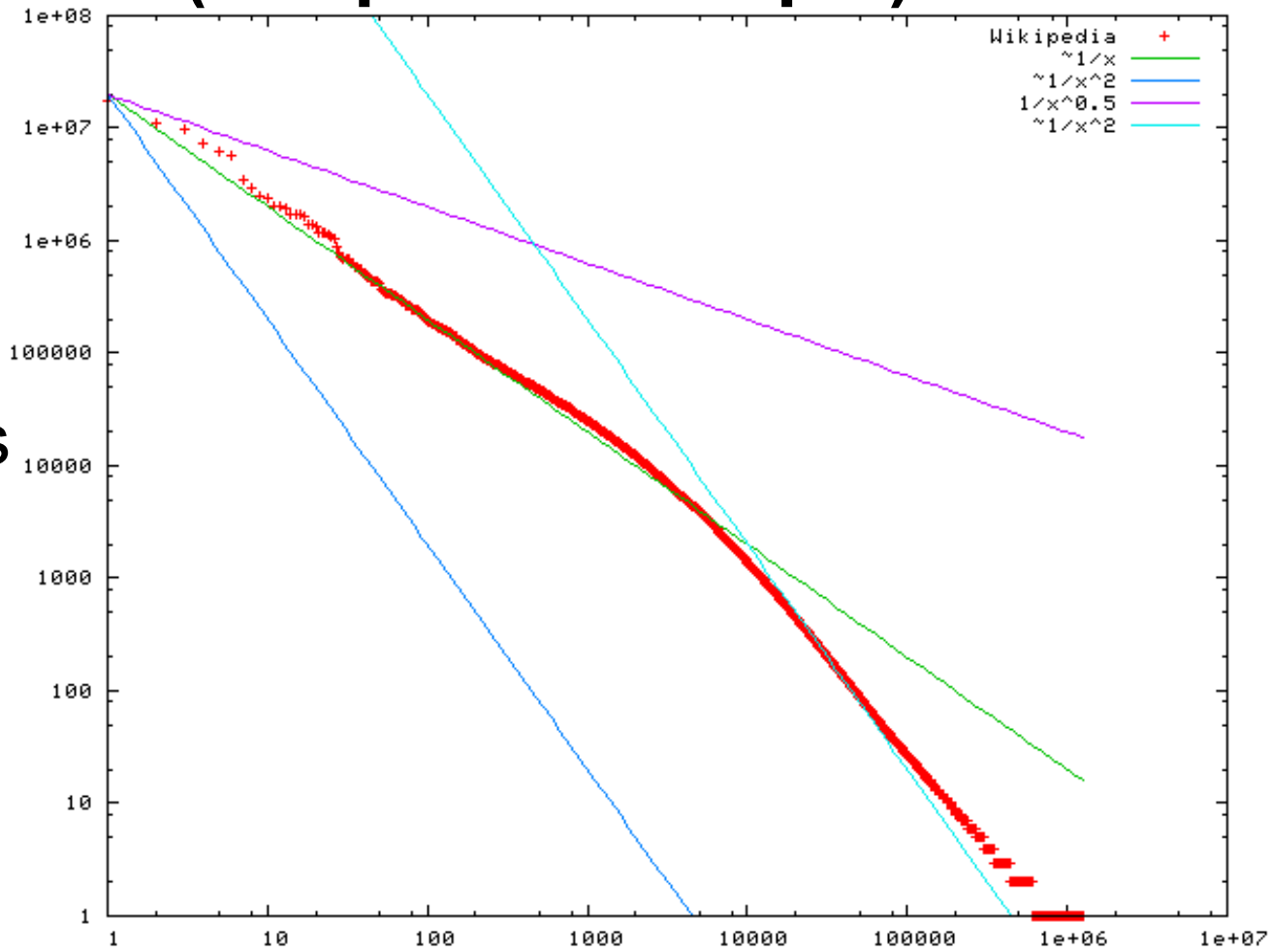
- Many things are hard to express
  - Feelings, situations, … (what is scary?)
  - What is in the image, what is it about, what does it invoke?
- Annotation is never complete
  - Plus it depends on the goal of the annotation
- Many ways to say the same thing …
  - Synonyms, hyponyms, hypernyms, …
- Mistakes
  - Spelling errors, spelling differences (US vs. UK), weird abbreviations (particularly medical …)

Basics in text retrieval

- Started with boolean search of words in text
  - In combination with AND, OR, NOT
  - No ranking, rather finite list of corresponding documents
- Vector space model to have distance between search terms and documents
  - Each occurring word is a dimension, its difference in frequency can be measured
  - Overall frequency of words as importance for axis

Zipf distribution (wikipedia example)

- X- rank
- Y- number of occurrences of the word



Principle ideas used in text IR

- Words follow basically a Zipf distribution
- Tf/idf weightings
  - A word frequent in a document describes it well
  - A word rare in a collection has a high discriminative power
  - Many variations of tf/idf (see also Salton/Buckley paper)
- Use of inverted files for quick query responses
  - Relevance feedback, query expansion, …

Techniques used in text retrieval

- Bag of words approach
  - Or N-grams can be used
- Stop words can be removed
- Stemming can improve results
- Named entity recognition
- Spelling correction (also umlauts, accents, …)
  - Google had a big success with this
- Mapping of text to a controlled vocabulary/ ontology

Stop word removal

- Very frequent words contain little information and can be removed
  - Automatically in Google et al.
- These words depend on the language
  - Stop word lists exist in many languages
    - Often 40-50% of texts
  - Contains also less frequent words not carrying information
- Or simply remove words above a certain frequency

Stemming - conflation

- Strongly dependent on the language
- Basically suffix stripping based on a set of rules
  - Cats, catty, catlike=cat as root or stem
- Can also create errors or slightly change meaning (errors often reported around ~5%)
- Porter stemmer for English is one of the most well known algorithms with a free implementation

Synonymy, polysemy

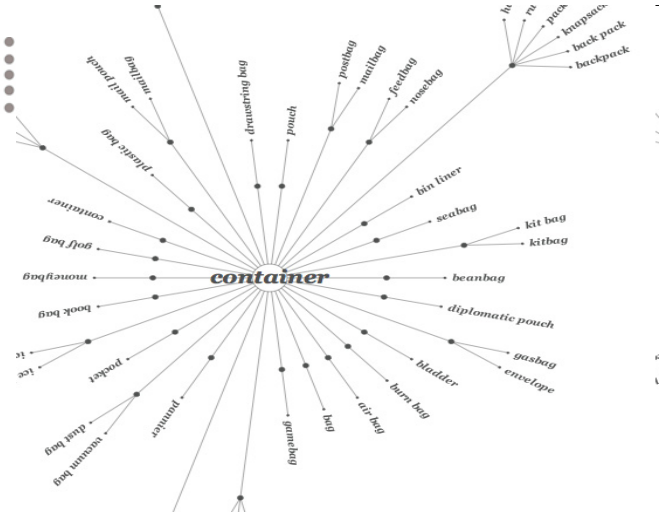
- Synonymy
  - Several words can say the same thing: car, automobile
- Polysemy
  - The same word can have several meanings
- Latent semantic Indexing (LSI)
  - Word cooccurences in the entire collection
  - Can reduce effects of synonyms

Query expansion vs. relevance feedback

- Most queries contain only very few keywords
- Add keywords to expand the original query
  - Can be automatic or manual
  - Semantically similar words, synonyms, discriminative words
- Often used in a similar way as relevance feedback but not with entire documents

Medical terminologies

- MeSH, UMLS are frequently used
  - Mapping of free text to terminologies
    - Quality for the first few is very high
  - Links between items can be used
    - Hyponyms, hypernyms, …
  - Several axes exist (anatomy, pathology, …)
    - This can be used for making a query more discriminative
- This can also be used for multilingual retrieval



Wordnet

- Hierarchy, links, definitions in English language
  - Maintained in Princeton
- Car, auto, automobile, machine, motorcar
  - motor vehicle, automotive vehicle
    - vehicle
      - conveyance, transport
        - » instrumentality, instrumentation
        - » artifact, artefact
        - » object, physical object
        - » entity, something

Apache Lucene

- Open source text retrieval system
  - Written in Java
- Several tools available
  - Easy to use
- Used in many research projects and in industry
- Image retrieval plugin exists
  - LIRE (Lucene Image REtrieval)
  - Using simple MPEG-7 visual features

Multilingual retrieval

- Many collections are inherently multilingual
  - Web, FlickR, medical teaching files, …
- Translation resources exist on the web
  - TrebleCLEF has a survey of such resources in work
  - Translate query into document language
  - Translate documents into query language
  - Map documents and queries onto a common terminology of concepts
- We understand documents in other languages

Cross Language Evaluation Forum (CLEF)

- Forum to compare multilingual retrieval in a variety of domains
  - GeoCLEF
  - QA CLEF
  - Domain-specific CLEF
  - …
- Proceedings are a very good start for multilingual techniques

Challenges in multi-linguality

- Language pairs have a strongly varying difficulty
  - Families of languages are easier for multilingual retrieval as more similar
- Resources available depend strongly on the languages used
  - English has many resources, German, Spanish and French quite a few but rare languages rather little

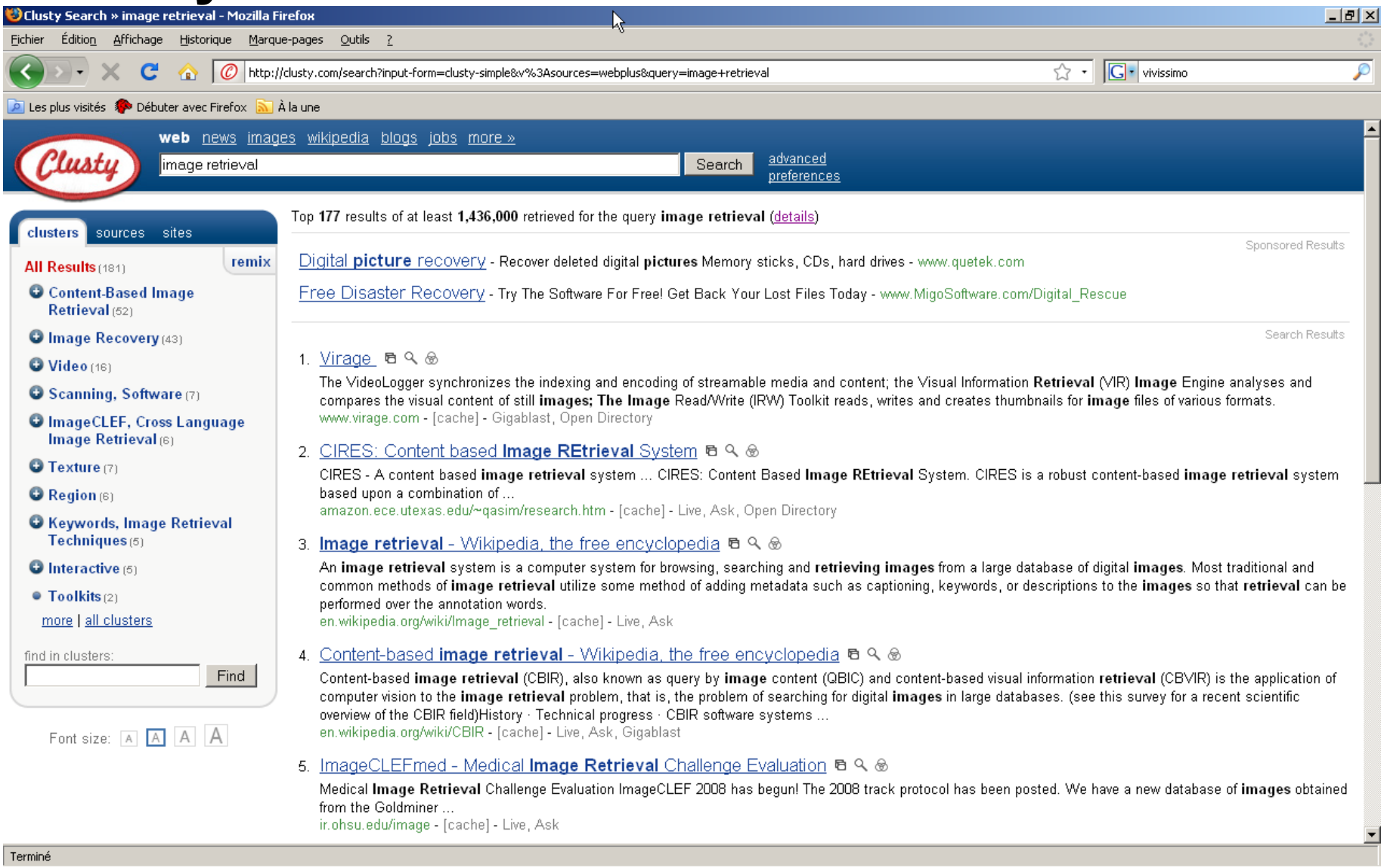
Multilingual tools

- Many translation tools are accessible on the web
  - Yahoo! Babel fish
  - www.reverso.net
  - Google translate
- Named entity recognition
- Word-sense disambiguation

Current challenges in text retrieval

- Many taken from the WWW or linked to it
- Analysis of link structures to obtain information on potential relevance
  - Also in companies, social platforms, …
- Question of diversity in results
  - You do not want to have the same results show up ten times on the top
- Retrieval in context (domain specific)
- Question answering

Diversity


Clusty Search » image retrieval - Mozilla Firefox
Fichier Édition Affichage Historique Marque-pages Outils ?
http://clusty.com/search?input-form=clusty-simple&v%3Asources=webplus&query=image+retrieval
vivissimo
Les plus visités Débuter avec Firefox À la une
Clusty
web news images wikipedia blogs jobs more »
image retrieval
Search
advanced preferences
clusters sources sites
remix
All Results (181)
Content-Based Image Retrieval (52)
Image Recovery (43)
Video (16)
Scanning, Software (7)
ImageCLEF, Cross Language Image Retrieval (6)
Texture (7)
Region (6)
Keywords, Image Retrieval Techniques (5)
Interactive (5)
Toolkits (2)
more | all clusters
find in clusters:
Find
Font size: A A A A
Top 177 results of at least 1,436,000 retrieved for the query image retrieval (details)
Sponsored Results
Digital picture recovery - Recover deleted digital pictures Memory sticks, CDs, hard drives - www.quetek.com
Free Disaster Recovery - Try The Software For Free! Get Back Your Lost Files Today - www.MigoSoftware.com/Digital_Rescue
Search Results
1. Virage
The VideoLogger synchronizes the indexing and encoding of streamable media and content; the Visual Information Retrieval (VIR) Image Engine analyses and compares the visual content of still images; The Image Read/Write (IRW) Toolkit reads, writes and creates thumbnails for image files of various formats.
www.virage.com - [cache] - Gigablast, Open Directory
2. CIRES: Content based Image REtrieval System
CIRES - A content based image retrieval system ... CIRES: Content Based Image REtrieval System. CIRES is a robust content-based image retrieval system based upon a combination of ...
amazon.ece.utexas.edu/~qasim/research.htm - [cache] - Live, Ask, Open Directory
3. Image retrieval - Wikipedia, the free encyclopedia
An image retrieval system is a computer system for browsing, searching and retrieving images from a large database of digital images. Most traditional and common methods of image retrieval utilize some method of adding metadata such as captioning, keywords, or descriptions to the images so that retrieval can be performed over the annotation words.
en.wikipedia.org/wiki/Image_retrieval - [cache] - Live, Ask
4. Content-based image retrieval - Wikipedia, the free encyclopedia
Content-based image retrieval (CBIR), also known as query by image content (QBIC) and content-based visual information retrieval (CBVIR) is the application of computer vision to the image retrieval problem, that is, the problem of searching for digital images in large databases. (see this survey for a recent scientific overview of the CBIR field)History · Technical progress · CBIR software systems ...
en.wikipedia.org/wiki/CBIR - [cache] - Live, Ask, Gigablast
5. ImageCLEFmed - Medical Image Retrieval Challenge Evaluation
Medical Image Retrieval Challenge Evaluation ImageCLEF 2008 has begun! The 2008 track protocol has been posted. We have a new database of images obtained from the Goldminer ...
ir.ohsu.edu/image - [cache] - Live, Ask
Terminé

Conclusions

- Text retrieval is a basis of image retrieval
  - Many techniques come from this domain
- Text has more semantics than visual features
  - But other problems as well
- Text and image features combined have biggest chances for success
  - Use text wherever available
- Multilingualism is an important issue as most of the web is very multilingual

References

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