

# Unified Hybrid Image Retrieval System with Continuous Relevance Feedback

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# Content

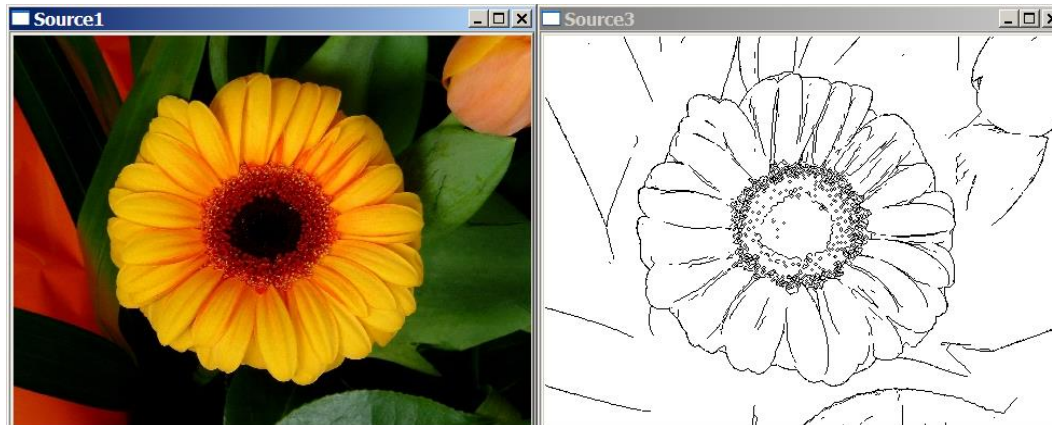
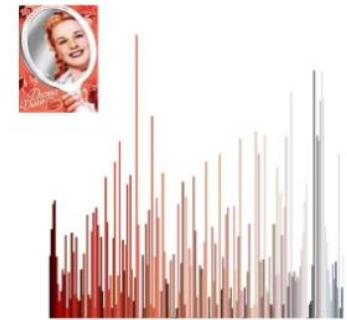
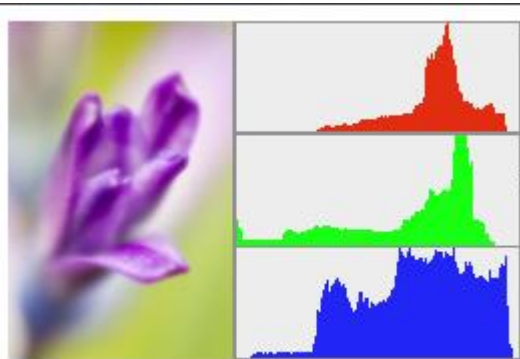
- ▶ Image Retrieval
  - ▶ Vector Space Model, Visual Example, similarity measurement, hybrid models - data fusion
  - ▶ Visual Features: low-level, mid-level, high-level
- ▶ Proposed unified system
  - ▶ System components
  - ▶ User interface
- ▶ Spin-off hybrid models and continuous relevance feedback
- ▶ Unified system in use - example

# Image Retrieval

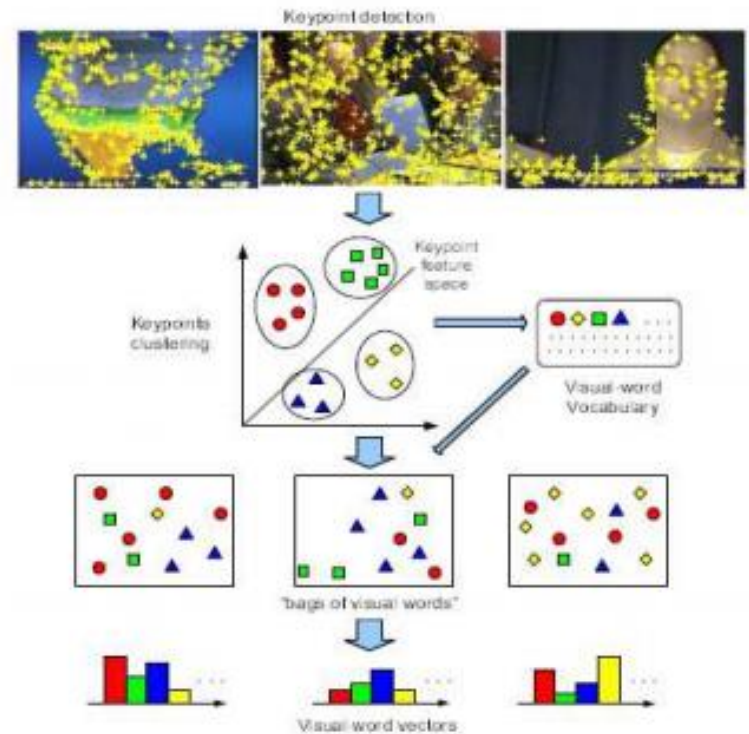
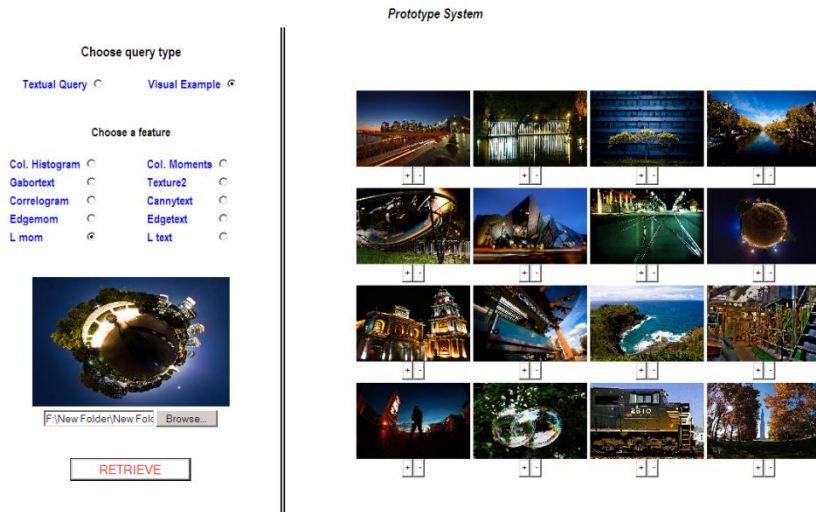
- ▶ Usually based on Vector Space Model
- ▶ Visual content and image tags represented as vectors
- ▶ Query represented as vector
- ▶ Angle or distance between vectors -> similarity
- ▶ Top ranked images presented to user (based on similarity scores)

$$sim(a, b) = \frac{\langle a|b \rangle}{\|a\| \cdot \|b\|}$$
$$sim(a, b) = \sqrt{\sum_i (a_i - b_i)^2}$$

# Global Visual Features – low-level



# Visual Features – mid-level



- ▶ (+) some ability to recognize objects
- ▶ (-) visual words have no semantic meaning

# Visual Features – high-level

- ▶ Grouping of visual words
- ▶ Segmentation-based
  
- ▶ (+) closest to human perception
- ▶ (-) not yet scalable to large data collections and generic image retrieval

# Unified Image Retrieval System

- ▶ Various visual features and their combinations
- ▶ Combination of visual and textual feature spaces
- ▶ Combination of visual and textual feature spaces in the context of search refinement
- ▶ Interactive user interface with user relevance feedback
- ▶ Relevance with continuous degrees of relevance
- ▶ Exploratory search
- ▶ Query history
- ▶ Positive and negative results panels

# Image representations and their combinations

- ▶ Visual features:
  - ▶ edge histogram
  - ▶ homogeneous texture
  - ▶ bag of visual words features
  - ▶ colour histogram
  - ▶ co-occurrence matrix
  - ▶ Combinations of the above

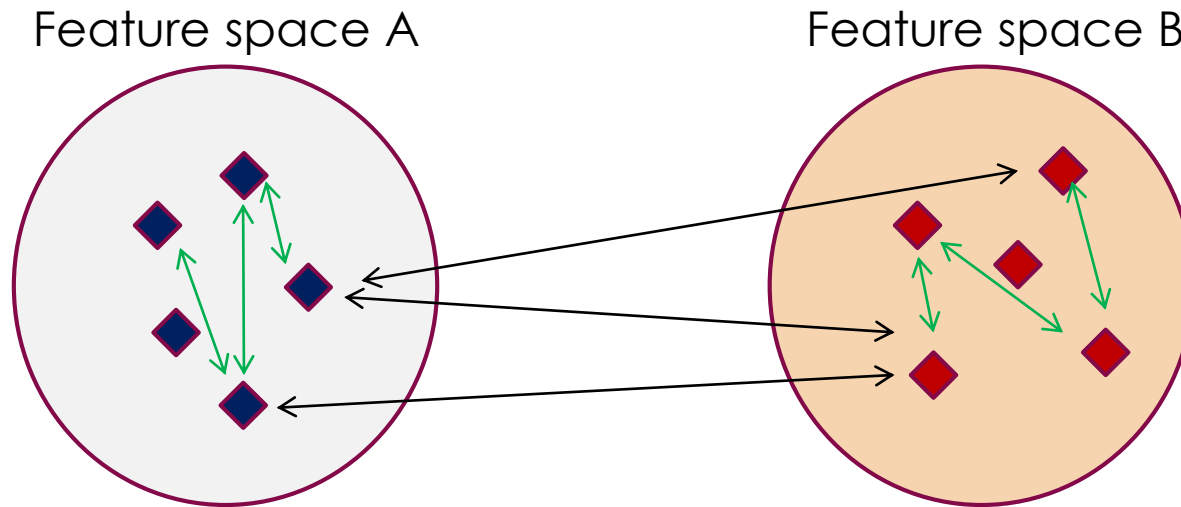


# Hybrid models

- ▶ Hybrid models
- ▶ Hybrid relevance feedback models
  - ▶ For re-scoring
  - ▶ For re-ranking
- ▶ Hybrid adaptive relevance feedback

# Hybrid models and tensor product

- ▶ Fusion of feature spaces improves the retrieval results in general
- ▶ We use tensors to fuse the feature spaces and to capture correlation and complementarity between them



↔ Intra-correlations

↔ Inter-correlations

# Adaptivity of Hybrid Models

- ▶ We measure the strength of the relationship between query and its context
- ▶ Weak relationship - context becomes important. We adjust the probability of the original query terms; the adjustment will significantly modify the original query
- ▶ Strong relationship - context will not help much. The original query terms will tend to dominate the whole term distribution in the modified model. The adjustment will not significantly modify the original query

Interactive User interface with User Relevance Feedback, Relevance with Continuous Degrees of Relevance, Exploratory Search, Query History Positive and Negative Results

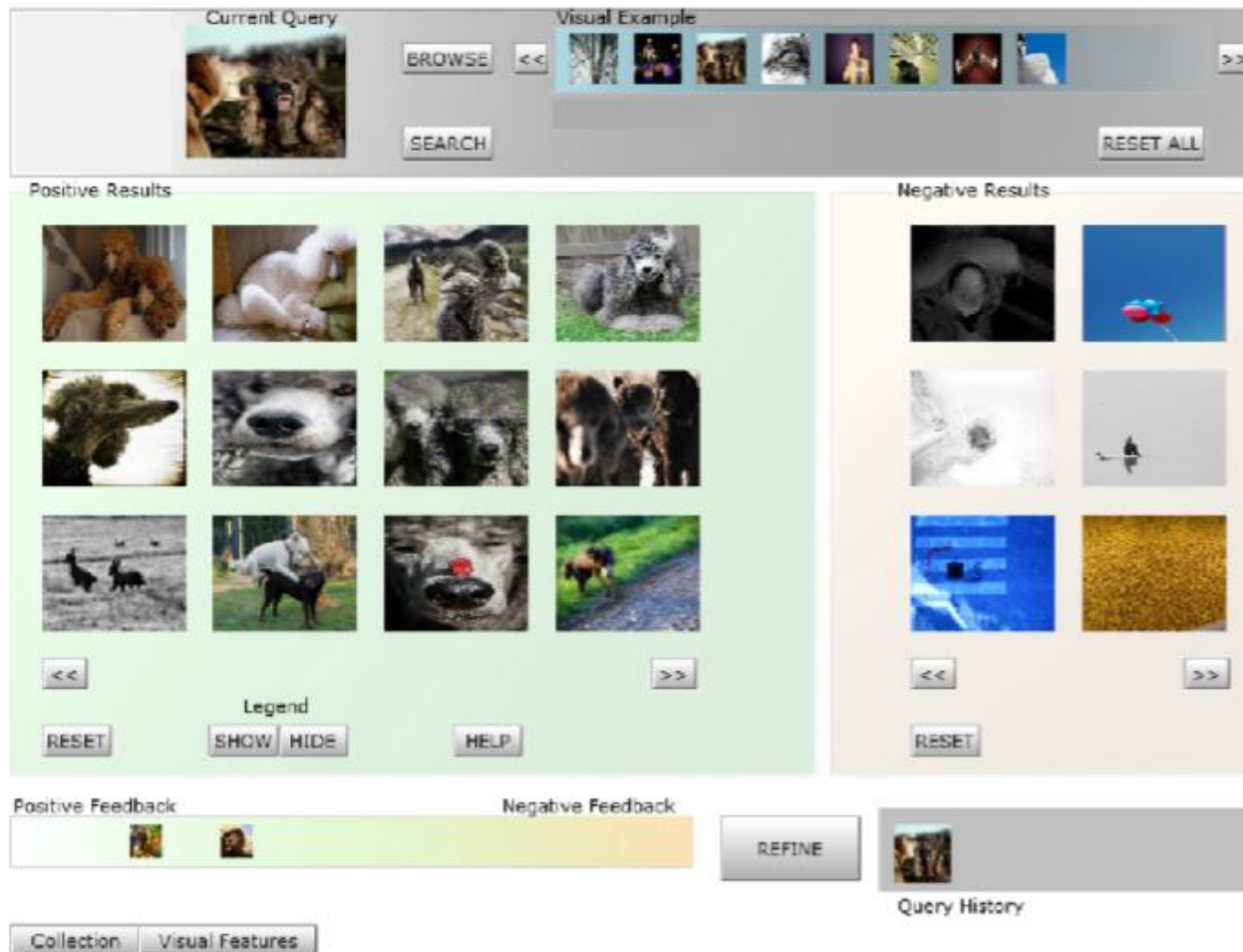


Fig. 1: User interface.

Thank you

