Panel

Progress in Description and Retrieval of Complex Multimedia Information

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(see above)

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A very short introduction for „non multimedians“ ...
Overview of a MIR System - Data

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- text
- sound
- video
- images
- 3D-models
- biological data

combination of above

e.g.: film
video information
audio information
subtitles
others
Overview of a MIR System

- How can this data be queried?
- „Typical“ database query:

  Give my all autofocus cameras with at least 5 Megapixels, that cost not more than 200 €.

  Easy! why ?: data is stored at a semantic level, equal to a typical query

- Problem: Multimedia raw data is stored at a very low semantical level (typically compressed)
- To query multimedia data we need an appropriate description of the data
- Content description for a multimedia object can be extracted or manually added
Overview of a MIR System - Description

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- automatically extracted features like (i.e. pictures):
  - color
  - texture
  - shape

- context information
  - EXIF parameters (i.e. gps data)
  - surrounding text
  - caption

- semantic concepts (i.e. car, plane, face, crowd of people, ...)

semantic gap
Overview of a MIR System - Retrieval

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Conventional queries:
- Point query
- Analytical query
- Range query (without ranking)

Multimedia query:
- Often (k-) nearest neighbor
- Query is interpreted as (virtual) multimedia object
- Ranking of results
- Definition of similarity measure
Overview of a MIR System - Retrieval

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Query By Example (QBE)
Query adaptive search strategies
Interactive retrieval
Personalized search
Browsing
Overview of a MIR System - Summary

- Multimedia objects cannot be queried directly
- Appropriate descriptors have to be found
  - Low level
  - contextual
  - semantic level
- Challenges [1]:
  - data representation
  - similarity measure
  - scalability
- Very interdisciplinary work:
  - signal processing, pattern recognition, machine learning, information retrieval, NLP, HCI, psychology, computational vision, optimization theory, ...
Sources


Aspect Retrieval Performance ...
Aspect: Retrieval Performance

- Curse of Dimensionality
  - Dimension > 20: no k-nearest neighbor (k-nn) algorithm is significantly faster than a linear scan [1]
  - For high dimensional range queries, traditional multidimensional indexes are slower than a linear scan [2]
  - Why? - Exponential grow of minimal bounding regions (MBR)
- Solutions:
  - Reduction of dimensionality (i.e. PCA\(^1\), ICA\(^2\))
  - Appropriate memory layout:
    - Approximate nearest neighbor search algorithms
    - Alternate index structure: Binned, compressed bitmap vector

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1. Principal component analysis
2. Independent component analysis
Aspect: Retrieval Performance

Comparision of random and sequential memory access

- random, disk: 1.26 mbytes/sec
- sequential, disk: 212.8 mbytes/sec
- random, SSD: 7.69 mbytes/sec
- sequential, SSD: 168.8 mbytes/sec
- random, memory: 146.8 mbytes/sec
- sequential, memory: 1432.8 mbytes/sec

Source: Adam Jacobs: The Pathologies of Big Data, acmqueue, July 2009
Approximate k-nn Algorithm *SphereDex*:

- Points are partitioned based on distance to a central point
- Make IO access sequential
- Intra partition index for effective pruning
- Partition fits in L2 cache
- Inter partition index for finding good starting point in neighbor partition
- Neighboring partitions are sequentially stored on disk
- About one order of magnitude faster than M-Tree, LSH

Source:
Aspect: Retrieval Performance

Fastbit Bitmap Index [5, 6]:

- based on WAH algorithm
- Multidimensional queries are mapped on AND/OR operations of (compressed) bitmaps
- significantly reduction of I/O
- pure sequential IO
- Binning to reduce number of bitmaps
- Further improvement with Order-preserving Bin-based Clustering (OrBiC) structure [4] (3-25 times faster than with best known multidimensional data structures)

Source:
Aspect: Retrieval Performance

Quintessence

- Sequential disk access is magnitudes faster than random access
- Appropriate memory layout can speed up the application significantly
- Approximate k-nearest neighbor is sufficient in most cases
  - feature vector is also an approximation
  - results are inspected by humans

- Bitmaps: Binnig and run length encoding is an appropriate combination to resolve the *curse of dimensionality*

Disadvantage of the proposed solutions: For read mostly applications only (append only)
Sources

Digital Audiovisual Media Preservation

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changes in the hardware, software, and physical media used to process and store digital data will continue into the indefinite future.

Most AV files are compressed. Whatever ‘original quality’ was lost in compression will remain lost. Preservation should maximise retention of quality, a capability that needs to be defined and added to current technology.

Richard Wright, BBC

we need preservation metadata in any processes that impact the communication of the digital information over time and ensure the generation of additional preservation metadata that describe the processing and its results.

MP-AF Draft
FP7 Coordination Action

The aim of the project is to: identify useful results of research into digital audiovisual preservation and to raise awareness and improve the adoption of these both by technology and service providers as well as media owners.

Presto4U is building Communities of Practices of audiovisual preservation related organizations.

We are also searching for audiovisual for science producers and archives to understand their preservation needs.
• Proposed Data Model and Representation for Multimedia Preservation Application Format (MP-AF)
  • specifies the lossless representation of metadata relevant to preservation of multimedia information for exchange of multimedia content between multimedia archives
  • is specified for exchange multimedia contents among multimedia archives, avoiding the loss of metadata for preservation
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Query Methods Research for Image Databases is Widespread

QBIC (Query by Image Content) content-based retrieval method

- QBIC queries large image and video databases using:
  - example images, sketches and drawings,
  - selected colour and texture patterns, camera and object motion and other graphical information
- (1) use of image and video content-computable properties of colour, texture, shape and motion of images, videos and their objects in the queries
- (2) Use of graphical query language, in which queries are posed by drawing and selecting user-constructed graphics

Source: QBIC technology is part of several IBM products
Adaptive MM Interface (AMPS)

MMMEDIA2013 - David Newell,
Bournemouth University
Towards Ontology Calculus

**Query method based on ‘Semantic Descriptor’**

QBSD (Query by Semantic Descriptor) learning object content-based retrieval method

- QBSD queries large learning object video databases using:
  - Ontology meta-level description of curriculum, learning objects, fragments, user-constructed questions, and FAQs
  - selected lessons, results of MPQ tests, and other learning or evaluation meta-data used to adaptively retrieve learning objects

- (1) use of text, image and video content meta properties - difficulty, level, content type, combine responses to questions, produce supplementary videos and learning objects from queries

- (2) Use of an adaptive semantic description is a form of query language, from which queries are processed, and used to display fragments of animated graphics, images and text

*Source: AMPS technology is part of several BU prototypes disseminated at MMEDIA2009-2013.*
CTN
...together we can succeed and make a difference ...

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The Fifth International Conferences on Advances in Multimedia, Venice.
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What are we Retrieving?
How do we learn KAV?
How do we remember?

Throw technology at it

How can we do?
What will it cost?
What are the casualties?

mak.sharma@bcu.ac.uk - MMEDIA 2013, The Fifth International Conference on Advances in Multimedia, Venice.
Over 60 hours of video are uploaded every minute, or one hour of video is uploaded to YouTube every second.

Over 4 billion videos are viewed a day

Over 800 million unique users visit YouTube each month

Over 3 billion hours of video are watched each month on YouTube

More video is uploaded to YouTube in one month than the 3 major US networks created in 60+ years

YouTube is localized in 39 countries and across 54 languages

1+ trillion views

140+ views for every person on Earth

500 years of YouTube video are watched every day on Facebook

Etc Etc ....

A better way of learning?

- Developed from adding video clips to moodle
- More defined aims and objective within each module via BCU+ gives focused delivery of content
- Focuses students to the task

Video everything !!!!
What are considering?

- HP Cloud
- Amazon Cloud
- Microsoft Cloud
- Cisco Servers - Cloud solutions
  & define your own optimised network SDN

What is reality or are we in the Cloud?
Any Questions

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