eMotion, Inc | Managing Digital Media

Multimedia IR in Context

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Overview

- Who uses multimedia IR?
- What is important to those users?
- Search issues
- Usability issues
- Application: digital media management

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User Base

- Creative professionals
- Kids doing homework
- Web surfers
  - Celebrities
  - Pornography
  - Travel
- E-commerce

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Requirements for Success

- Appropriate technology
- Solvable problems
- Follows customer's business model
- User-centered interactions

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Priorities

- Speed
  - 1-2 seconds
- Usability
  - Comprehensible at a glance, usable for hours
- Adequacy
  - Some retrieval technology is adequate for sports, but not for broadcast news or feature film

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Priorities, cont.

- Accuracy
  - Focus on precision over recall
    - Users' confidence is eroded if they see junk
    - Few users know what is in the collection, so recall is of less importance
  - First screen is critical
    - Users are lazy
    - "Precision at 20" may be the best measure

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Multiple Search Modalities

:: text search :: tiger| search

:: voice ::

:: drawing ::

:: fielded metadata :: mammal | tiger | fangs | image

Advanced Search Modalities

"like this but with dark hair"

singing

natural language Portrait of a tiger showing its fangs search

"left, seated"

touch screen

Technologies Behind Search

- Voice input
  - Speech recognition
    - Advances will require moving beyond the signal and a vocabulary list, to phonemes and syntax, even discourse analysis
- Drawing
  - Template matching
  - Multidimensional feature space

Search Technologies

- Fielded metadata
  - Standards efforts for field names
  - Open-ended if possible
  - Combine with other modalities
  - Users do not like to fill out big forms
- Text search
  - Frequency-based Boolean keyword search

Search Technologies

- Singing
  - "Match that tune" audio retrieval
  - Similar to voice recognition
- Touch screen
  - Identify a region of an existing file and ask for matches (color, shape, texture)

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Search Technologies

- Natural language
  - Part of speech tagging
  - Stemming, morphology
  - Pattern-matching
  - Partial or even full parsing
  - Semantic net

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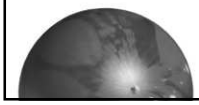
Natural Language Search

- Part of speech tagging
  - Distinguish nouns, verbs, adjectives, adverbs
    - *crane* (your neck)
    - *crane* (bird or equipment)
  - Limits spurious choices and bad synonyms
  - 99% accurate
  - Primarily statistical



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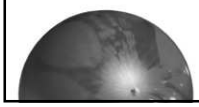
Natural Language Search

- Stemming, morphology
  - *run-s*
  - *run-ning*, not *runn-ing*
  - *ran* yields *run*



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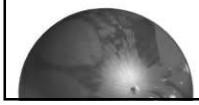
Natural Language Search

- Pattern-matching
  - Names
    - First name variants, for English and other languages: *Bill, William, Billy, Will, Willy, Guillaume*
    - English name pattern: middle name or initial, *Jr.*
    - Spanish: mother's surname at end
  - Adj-noun groupings
    - *tiger shark*, *fire truck*
    - Different from *tiger*, *truck fire*



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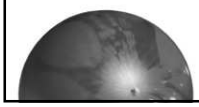
Natural Language Search

- Partial or even full parsing
  - *a mountain covered with snow*
  - *snow-covered mountain*
  - *cart pulled by a horse*
  - *horse pulling a cart*
- Complexity tradeoff



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Natural Language Search

- Semantic net
  - Beyond a thesaurus
  - Start with a resource for English and then tailor it, rather than starting with nothing
    - WordNet: 100,000+ terms
    - Gazetteer, lexicons
    - A large manually-created resource may only reach 30,000 terms, with enormous maintenance overhead

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Semantic net

- Multiple relationships
  - Synonymy
    - *cougar - puma - mountain lion*
  - Hyponymy
    - *bird - owl*
  - Meronymy
    - *snow - snowflake, beach - sand, car - brakes*
- Avoid full-scale AI knowledge base

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Search Technologies

- Discourse-based strategies
  - "Like this but with dark hair"
    - Assumes a model of an existing query or file
    - Knowledge of where substitution should be made
  - "Left, seated"
    - Use info provided in captions
    - Srihari (various, 1991-1995)

Metadata Mantra

- When creating the metadata design, ask:
  - How are people going to search for this?
  - What are the reuse options?
- Not:
  - What categories of information can I attach?
  - What will people need to know once they have found what they want?

Usability Strategies

- Model the types of users
- Determine what functions they use
  - How often
  - For how long at a stretch
  - Often enough to remember shortcuts?

Usability

- Layer the information
  - Group functions sensibly
  - Hide functions from the top-level intro user
  - Images should not be tiny
    - Watermark as needed to protect intellectual property
  - Simple backgrounds, focus on assets

Usability

- Ask what the technology buys you
  - Will someone want your AI engine to crank through the relationship between *Barbra Streisand* and *director*, or can you just list those facts separately? (cf. MPEG-7 Semantics Description)
  - Keyframes: do you really need sophisticated strategies, or will every 30 seconds do?

Accuracy

- Is face recognition mature enough to be helpful? Object recognition?
- In what constrained environments could they be useful?
  - E.g. voice recognition “Say or press 1”

What is Digital Media Management?

- Software that allows media companies to better manage their digital and analog media.
- Solutions that can enable effective e-commerce, link to media production systems and rights management, and provide the infrastructure for an effective digital media environment.

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What does DMM do?

- Helps organizations that create, use or reuse digital media
- Allows clients to save money and become more productive, by helping them to more effectively
  - *Find*
  - *Collaborate*
  - *Retrieve*
  - *Protect*
  - *Re-purpose*
  - *Deliver/Distribute*

  their digital assets

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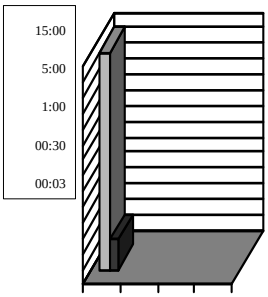
DMM Saves Time

– Dramatically reduces the time **wasted searching** for files from **minutes to seconds**.

According to Gistics, it takes an average of 15 minutes to find a file in a file hierarchy if you don't know where it is. With Natural Language searching, it takes less than 3 seconds.



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