[Browsing multimedia libraries with MediaCycle]

Multitel workshop on video analysis

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Outline

1. Introduction
   - HyForge research axis
   - State-of-the-art: other applications

2. MultiMediaCycle
   - Analysis: extract and summarize information
     - Audio Analysis
     - Image Analysis
     - Video Analysis
   - Data mining and Visualization
   - Rapid Prototyping of User Interfaces

3. Demos
   - Audio Demo
   - Video Demo

4. Perspectives
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HyForge research axis

- goal: organize multimedia databases for
  - browsing whole database
  - retrieving closest items
- software: MediaCycle
  - Audio
  - Image
  - Video
- based on content analysis
  - historically: Query By Image Content (IBM, 1995)
- artistic applications
  - Méta-crâne (Thomas Israël)
  - DANCERS! (Bud Blumenthal)
  - BorderLands (Christian Graupner)
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4 Perspectives
Tag-based query
Content-based query

Flexible Image Retrieval Engine

Retrieval Result
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Audio analysis and features extraction

- **Timbre Descriptors**
  - **Spectral features:**
    - centroid, spread, slope, $F_0$,
    - flatness (noisiness),
    - MFCC, $\Delta$(MFCC)
  - **Temporal features:**
    - Envelope modulation amplitude and frequency

- **Pitch/Harmony Descriptor**
  - Chroma: Accumulate octave-separated outputs from chromatic scale filterbank

- **Rhythm Descriptor**
  - Periodicity analysis of perceptual spectral flux

(Alain Souchon - Allô maman bobo)
Image analysis and features extraction

- **Color Descriptors**
  - color histogram and moments

- **Texture Descriptor**
  - Gabor wavelets
  - Fourier-based descriptors

- **Shape Descriptor**
  - Hu moments
  - SIFT, SURF
Video analysis and features extraction

Dance Videos

- global space occupation
- compactness of trajectory
- contraction index
- speed
- floor work
- ...

(movie - Dancers Project)
Video analysis and features summarization

Dance Videos

- features extracted for each frame
- summarize this information
  - statistics: mean, std, ...
  - segmentation
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Data mining and Visualization

- Mapping multidimensional data to a 2D display.
- Constraints:
  - show internal organization of the dataset or relation between data,
  - easy to understand and to handle
  - "look nice".
- Two visualization problem:
  - Exploration : Navigating without goal,
  - Query : Finding content similar to a query.
- Algorithm design:
  - Data dependent: different kind of data requires different visualization,
  - Application dependent (AudioCycle, LaughterCycle, Dancers ...).
- Flexible design tool is necessary.
Visualization Framework

• Rapid prototyping,
• Incorporated in Mediacycle,
• Plugin architecture,
• Simple data structure,
• Data Mining utilities,
• Multimodal:
  ▶ visualization,
  ▶ audio rendering,
  ▶ OSC control input
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Rapid Prototyping of Hypermedia User Interfaces

- beyond keyboard and mouse:
  - 3D mouse
  - jogwheel
- PureData:
  - discovery of off-the-shelf USB HID devices with [hidio]
  - filtering and mapping using dataflow objects
  - on-the-fly mapping edition at runtime
  - OSC control output
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AudioCycle Demo
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VideoCycle Demo
available online! (www.dancersproject.com)
Perspectives

• Design new interfaces (e.g., multitouch)
• Keep history of navigation (e.g., Google Images Swirl)
• Scalability (huge databases)
  ▶ parallel computing of features ✓
  ▶ hierarchical data organization and display
• Validation: compare with manual annotations
• Relevance feedback
• Mix media
• Combine keyword and content analysis