Shot Boundary Experiments at The University of Iowa

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Basic Assumptions

- A relatively small number of ‘basic’ metrics can be composed into a metric that can perform well
  - Observed with ASR (e.g., Rover)
- For this year, focus on localized video measures
  - i.e., contiguous pairs of frames
Basic Metrics

- Color Histogram Similarity
  - pixels compressed to a 9-bit color scheme, yielding a 512-bin histogram
- Frame Color Distance
  - scale frames to 60 x 60 thumbnails and then average the color space distance of all pixel pairs
- Frame Edge Distance
  - generate an edge representation of frames and then the percentage of entry and exit edges
A Sample Image
A Sample Image
Composite Metrics

- Boolean Predicate of Basic Metrics
  - Composite-1: $h < 0.95 \& (d < 0.80 \text{ or } e < 0.85)$
  - Composite-2: $(h < 0.82 \& d < 0.82) \text{ or } (h < 0.79 \& e < 0.79)$

- Product of Basic Metrics
  - $d \times e \times h < 0.60$
Tuning / Visualization

19980104_ABC.mpg

![Graph showing similarity over time](19980104_ABC.mpg)
Tuning / Visualization
# Official Runs

<table>
<thead>
<tr>
<th>Run</th>
<th>Metric</th>
<th>All</th>
<th>Cuts</th>
<th>Gradual</th>
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<td>Prec</td>
<td>Rec</td>
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</table>
Shot Boundaries, Overall Results
Shot Boundaries, Cut Transitions

![Graph showing precision-recall performance of different methods]

- histogram
- distance
- composite-1
- product
- composite-2
Shot Boundaries, Gradual Transitions

![Graph](image)
Shot Boundaries,
By Transition Type & Source

Cut Transitions, Basic Methods

Cut Transitions, Composite Methods

Precision

Recall

ABC histogram
ABC distance
CNN histogram
CNN distance

ABC composite-1
ABC product
ABC composite-2
CNN composite-1
CNN product
CNN composite-2

0 0.2 0.4 0.6 0.8 1
0 0.2 0.4 0.6 0.8 1
Shot Boundaries,
By Transition Type & Source

Gradual Transitions, Basic Methods

Gradual Transitions, Composite Methods

ABC histogram
ABC distance
CNN histogram
CNN distance

ABC composite-1
ABC product
ABC composite-2
CNN composite-1
CNN product
CNN composite-2
Conclusions

- Basic metrics can perform surprisingly well on cuts
- Composite metrics can damp out peculiarities of component metrics, just as in ASR
- Product metrics appear to be the way to go
  - No arcania of boolean exploration
Future Work

• The obvious...
  • Frame sequence metrics
  • Follow the approach presented here
• Specialized event detectors
  • camera flash
  • video effects (e.g., wipes, dissolves, ...)