Personalized News Video Retrieval

Jianping Fan
Department of Computer Science
University of North Carolina at Charlotte
Charlotte, NC 28223
jfan@uncc.edu
http://www.cs.uncc.edu/~jfan
Why we need personalized news retrieval?

- People may not know what they want to search or look for----how we can know what will happen today?

- The search results may be too broad or too large for users to assess the relevance between the retrieved results and their real query intentions!---one-size-fits-all!
Why news videos are important?

- For general audiences, News broadcast is the most important channel for information observation!

- For Governments, News broadcast is used for citizen education and official announcement!
Why news videos are important?

- **Terrorists** are also using news broadcast channels to **display their announcement, formulate their plans, raise funds, spread propaganda!**

- News broadcast may also report local disaster information such as bird flu!
1. What are the opinions from these guys and their countries?
2. What are their citizen opinions and national discussion for this special event?
3. Who will be our friends to collaborate for solution?

All these are on international broadcast news!
What we expect?

- Systems can recommend or present the most interesting news to users, and users can make their decisions intuitively according to their personal interests!
- Systems can change their presentations of news according to the users’ query interests!
- Systems should be able to enough users’ access!
What we should do?

- Automatic News story extraction
- News item visualization and exploration
- Query intention capturing and adaptation
- News video presentation and display
1. Automatic News Story Extraction

- Video Channel: Shot Detection
- Speech Channel: Speech Recognition
- Close Caption Channel: Entity Extraction
- Data & Decision Fusion & Synchronization
1. Automatic News Story Extraction

- Multi-Modal Broadcast News
  - Key frames from video channel
    - Video shot detection & salient object detection
    - Automatic key frame identification
1. Automatic News Story Extraction
1. Automatic News Story Extraction

- Multi-Modal Broadcast News
- Salient Object Detection for Video Understanding
1. Automatic News Story Extraction

- Multi-Modal Broadcast News
  - Probabilistic Reasoning for Video Understanding
    \[ P(X, S_j, \theta_s) = \sum_{i=1}^{\kappa} P(X | R_i, \theta_{s_i}) P(R_i) \]

- War in Iraq
- Video Concept
- Salient Objects
1. Automatic News Story Extraction

Multi-Modal Broadcast News

- Probabilistic Reasoning for Video Understanding
  - Gaussian mixture model for concept modeling
  - Multi-class EM algorithm for parameter estimation

\[ \Theta^* = \arg \max_{\Theta} \{ \log L(\Theta | X) \} \]

Need more accurate modeling.
1. Automatic News Story Extraction

- Multi-Modal Broadcast News

- **Keywords & Sentences from close captions**
  
  - Natural language processing is used for keyword detection
  
  - Some frequent words are removed
1. Automatic News Story Extraction

- Multi-Modal Broadcast News
  - Keywords from Speech Recognition
1. Automatic News Story Extraction

- Multi-Modal Broadcast News
  - Multi-Modal Information Synchronization
1. Automatic News Story Extraction

- Multi-Modal Broadcast News
  - News Topic Detection
    - Temporal context analysis
  - Multi-source linkage analysis
1. Automatic News Story Extraction

- Multi-Modal Decision Fusion
  - Interesting News Topics from Close Caption
  - Interesting News Topics from Video Channel
  - Interesting News Topics from Internet

- Multi-Modal Decision Fusion via Boosting
1. Automatic News Story Extraction

News Interestingness

- **Hypothesis & Probabilistic Reasoning**
  - Why a news story is more interesting than others
    - It carries more *information*

\[
\{P(S_j, G)\} \quad \text{Out dated news stories} \\
\text{Predictor} \\
\times \\
\text{Interestingness} \\
\{P(S_j, L)\} \\
\text{Set of news stories}
\]

\[
w(L|G) = \sum_j P(S_j, L) \log \frac{P(S_j, L)}{P(S_j, G)}
\]
2. News Network Extraction

- News Network Construction

- Co-Occurrence Probability
  \[
  \rho(C_i, C_j) = \frac{P(C_i, C_j)}{P(C_i) P(C_j)}
  \]

- Contextual Probability
  \[
  \pi(C_i, C_j) = -\log \frac{\text{length}(C_i, C_j)}{2D}
  \]
2. News Network Extraction
2. News Network Extraction

- What News network can tell us?
  - Good global overview of large-scale news collections
  - News Correlations
  - News Importance

Allow Users to make better query decisions!!
2. News Network Extraction

- Network-Oriented News Retrieval
3. News Change Trend Extraction

- News Importance Representation
3. News Change Trend Extraction

- News Change Trend Representation
3. News Change Trend Extraction

- Change-oriented news retrieval
4. Personalized News Retrieval

Global News Network
4. Personalized News Retrieval

Personalized News Network
4. Personalized News Retrieval

Personalized News Network