

Visual Analysis of Multimedia Data

DHS University Network Summit
Washington, March 15-16, 2007



SouthEast Regional Visualization and Analytics Center

A collaboration between UNC Charlotte and Georgia Tech

Co-PIs

[Jianping Fan](#), Assistant Professor, Computer Science, UNC Charlotte

[Ashok Goel](#), Associate Professor, College of Computing, Georgia Tech

[Beki Grinter](#), Associate Professor, College of Computing, Georgia Tech

[James Foley](#), Stephen Fleming Chair in Telecommunications, College of Computing,
Georgia Tech

[Robert Kosara](#), Assistant Professor, Computer Science, UNC Charlotte

[Anita Raja](#), Assistant Professor, Software and Information Systems, UNC Charlotte

[William Ribarsky](#), RVAC Principal Investigator and Bank of America Endowed Chair,
Computer Science, UNC Charlotte

[John Stasko](#), Professor, College of Computing, Georgia Tech

[William Tolone](#), Associate Professor, Software and Information Systems, UNC Charlotte

[Jing Yang](#), Assistant Professor, Computer Science, UNC Charlotte

www.srvac.uncc.edu



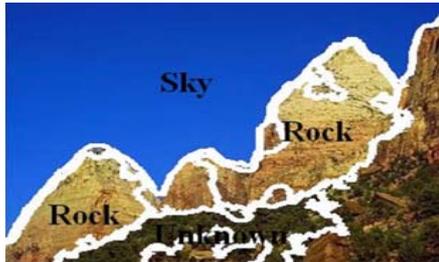
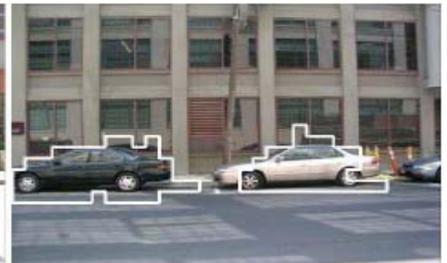
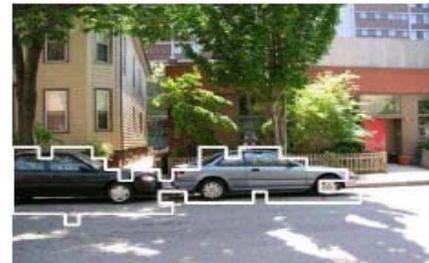
Explosive Growth of Digital Multimedia Content

- Web growth is no longer exponential, but it is still fast (25% per year from 2002-2006).
 - There are now 100M sites. Predicted growth to 200M by 2010-12. (According to Jacob Nielsen, there are 200M companies, government agencies, etc. in the world.)
 - 747M people work in the world (China, India, and Africa).
 - There is evidence of radical behavior (60 MiB per second).
- Podcasts, which did not exist in 2002, are growing exponentially.
- Hundreds of broadcast channels are now available over the Internet, up from 70M by 2010).
- New digital services causing explosive growth in Europe. “Europe by Satellite” now on Sirius. More than 2,000 channels can now be received by SES satellite positions over Europe.
- In the Middle East, the number of Arabic satellite channels has risen from 1 in 1990 to over 200 today (Arab American Institute).

How can anyone fully grasp any aspect of this content?



Multimedia: Semantic Image Content Analytics

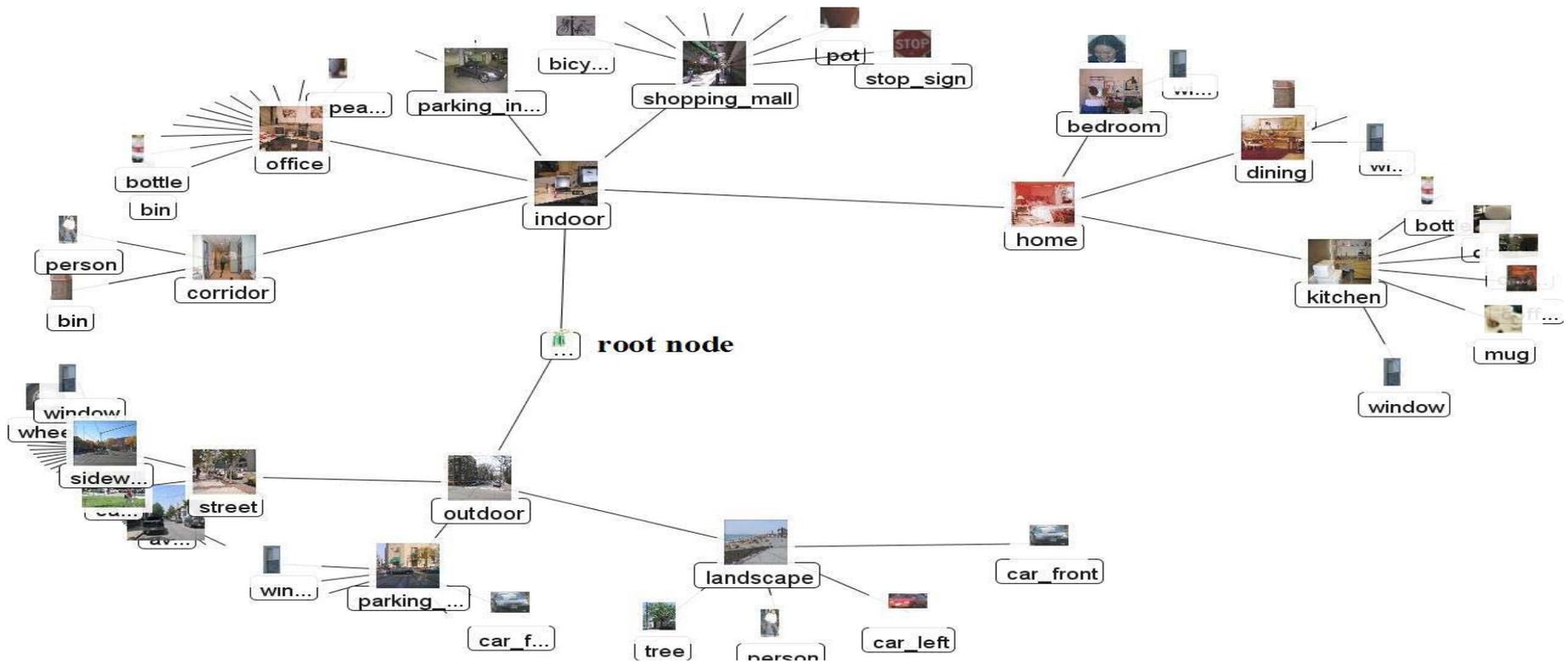


Thousands to tens of thousands or more unannotated images

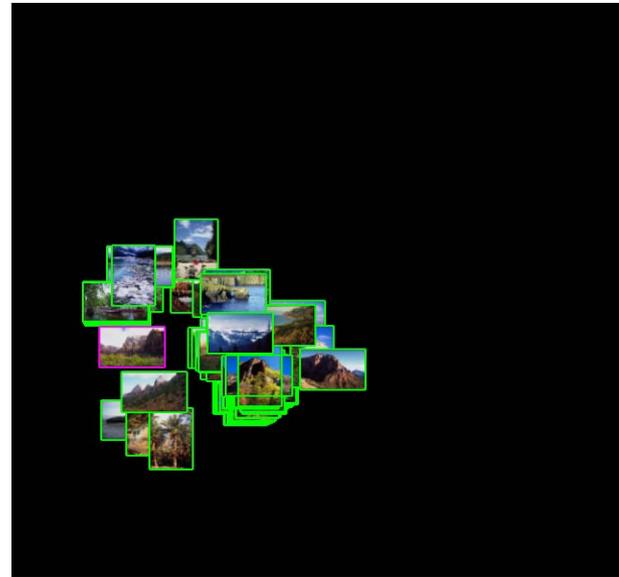


Multimedia: Semantic Image Content Analytics

Concept Ontology Visualization



Exploratory Analysis: Large Scale Image Browser



Users can select a sample image and select images similar to it

Selected images can be visualized in different ways

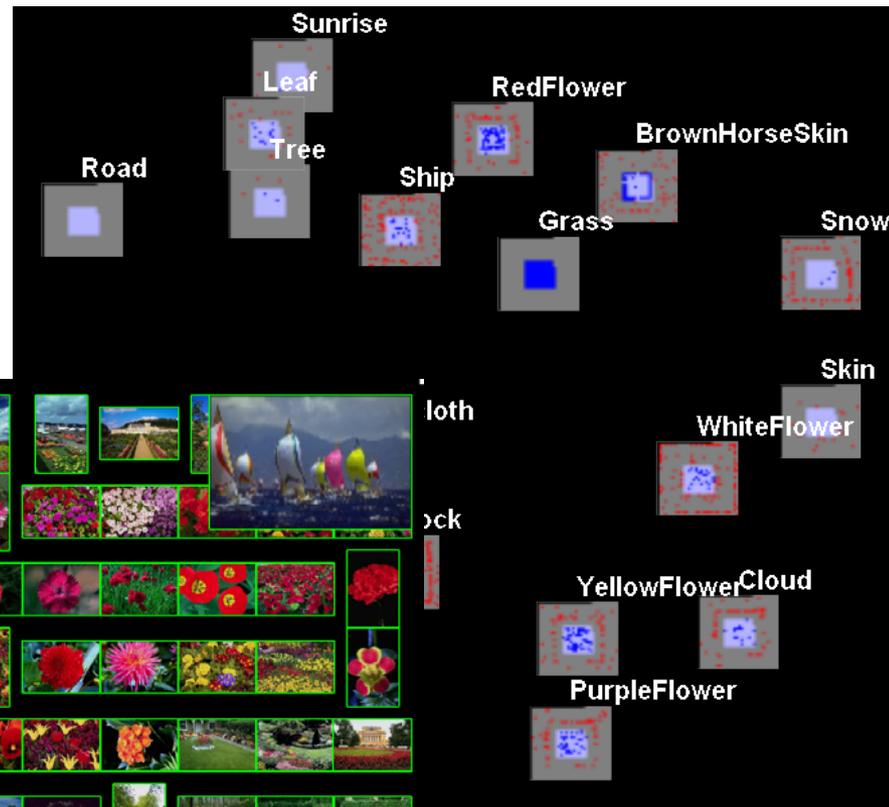
- (1) global MDS
- (2) selected only
- (3) Sequential order
- (4) MDS of selected images



Exploratory Analysis: Large Scale Image Browser



MDS image view
Search by similarity

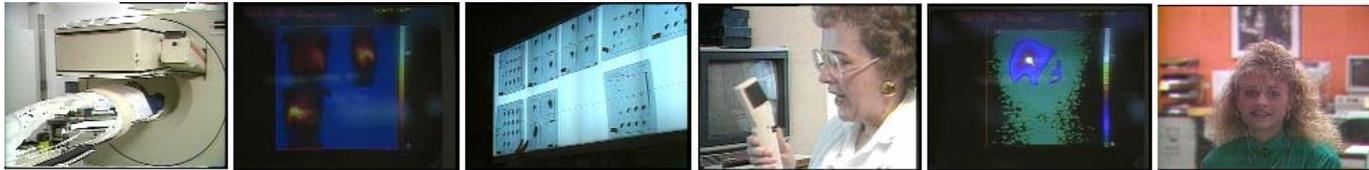


Content view
by content

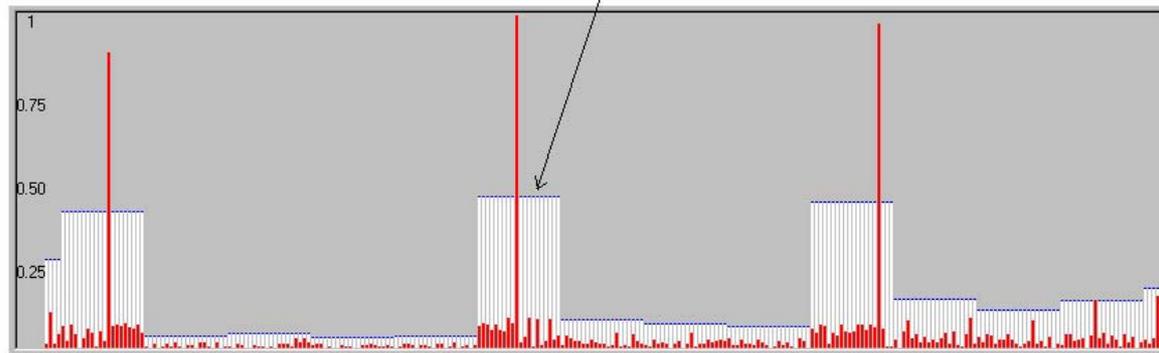
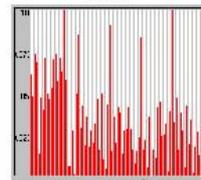


Multimedia: Video Content Analysis

- Audio and Video Analysis: **Story Boundary Detection**

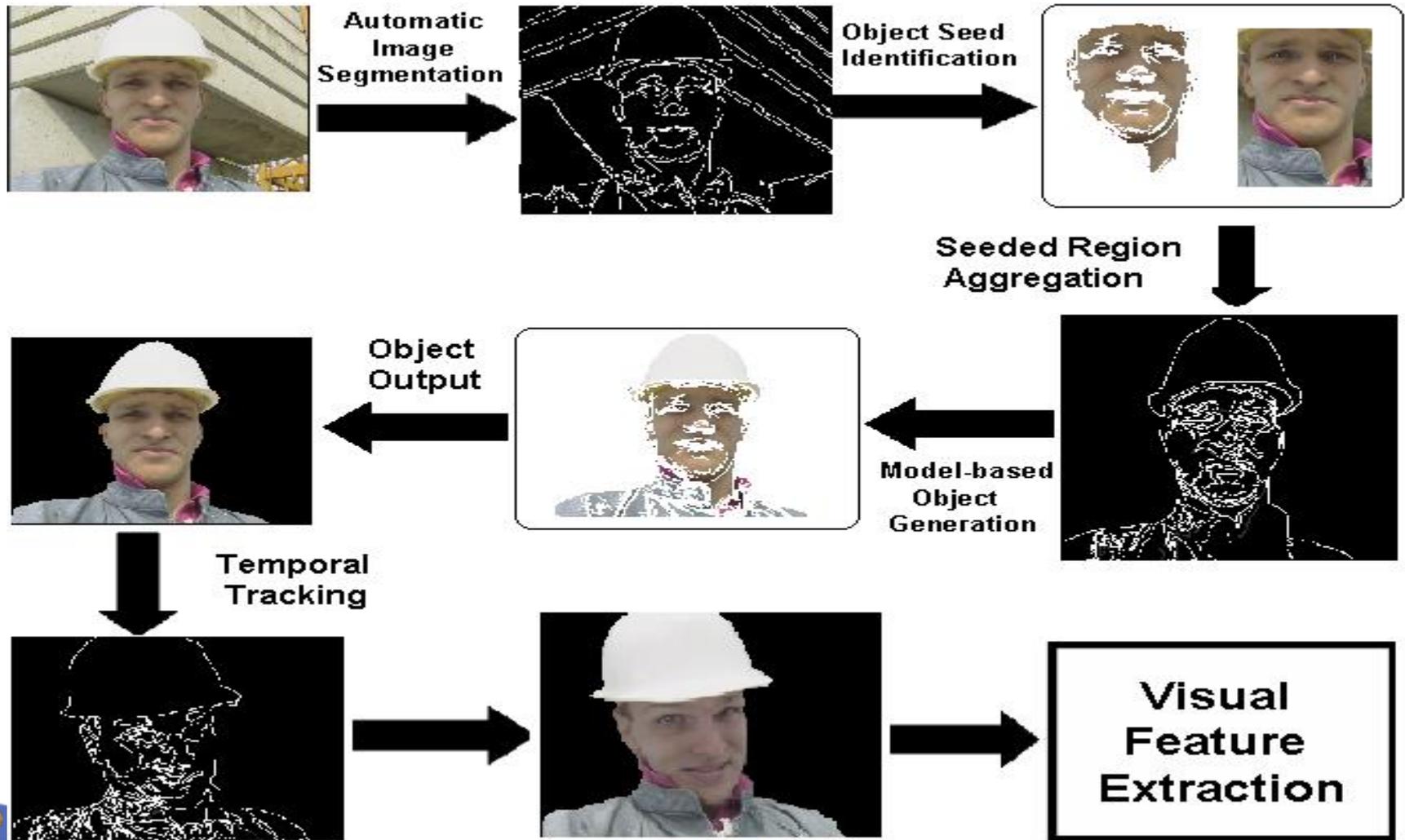


(a)



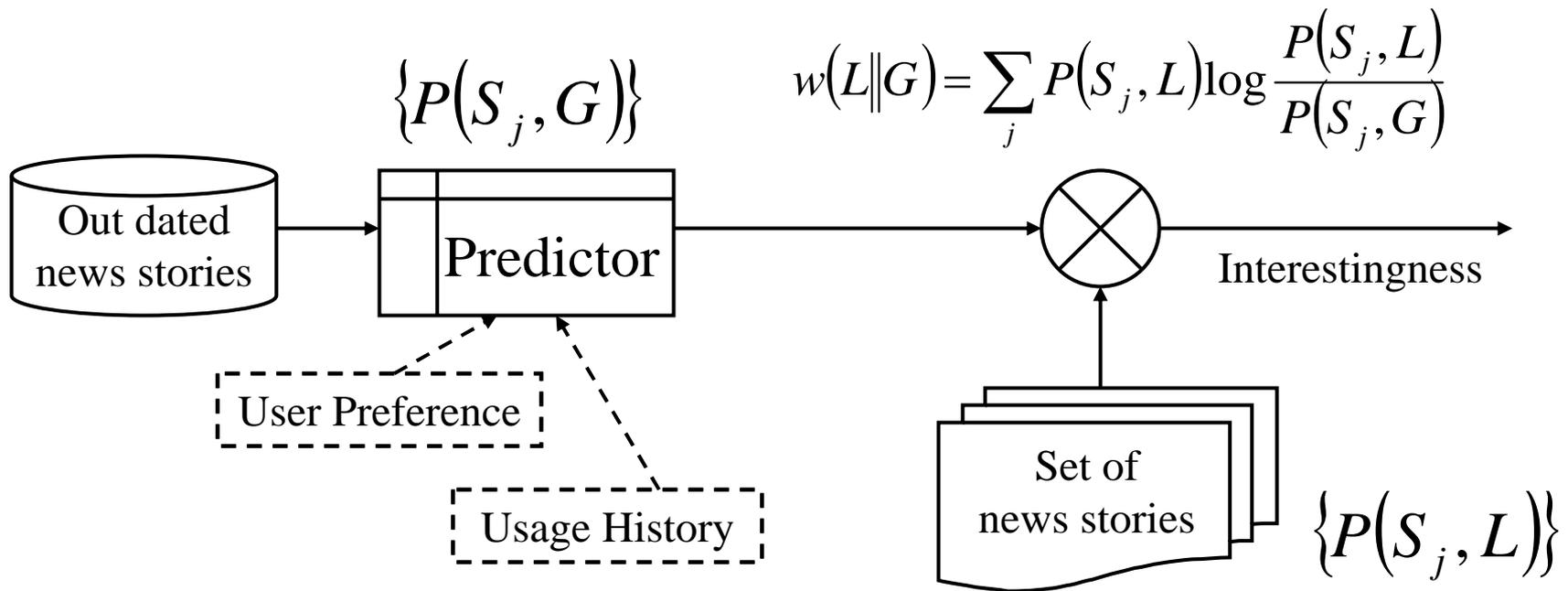
(b)

Multimedia: Video Content Analysis



Multimedia: Video Semantic Analysis

- News Interestingness Prediction



Multimedia: News Broadcast Analysis

Problem – How to monitor and investigate many news stories over many channels using both automated and user driven analyses.

Solution –

1. Do full, automated multimedia analysis on video stream (video, audio, closed captions)
2. Develop interactive interface for visual exploration, discovery, and annotation



American Broadcasts

Japanese Broadcasts

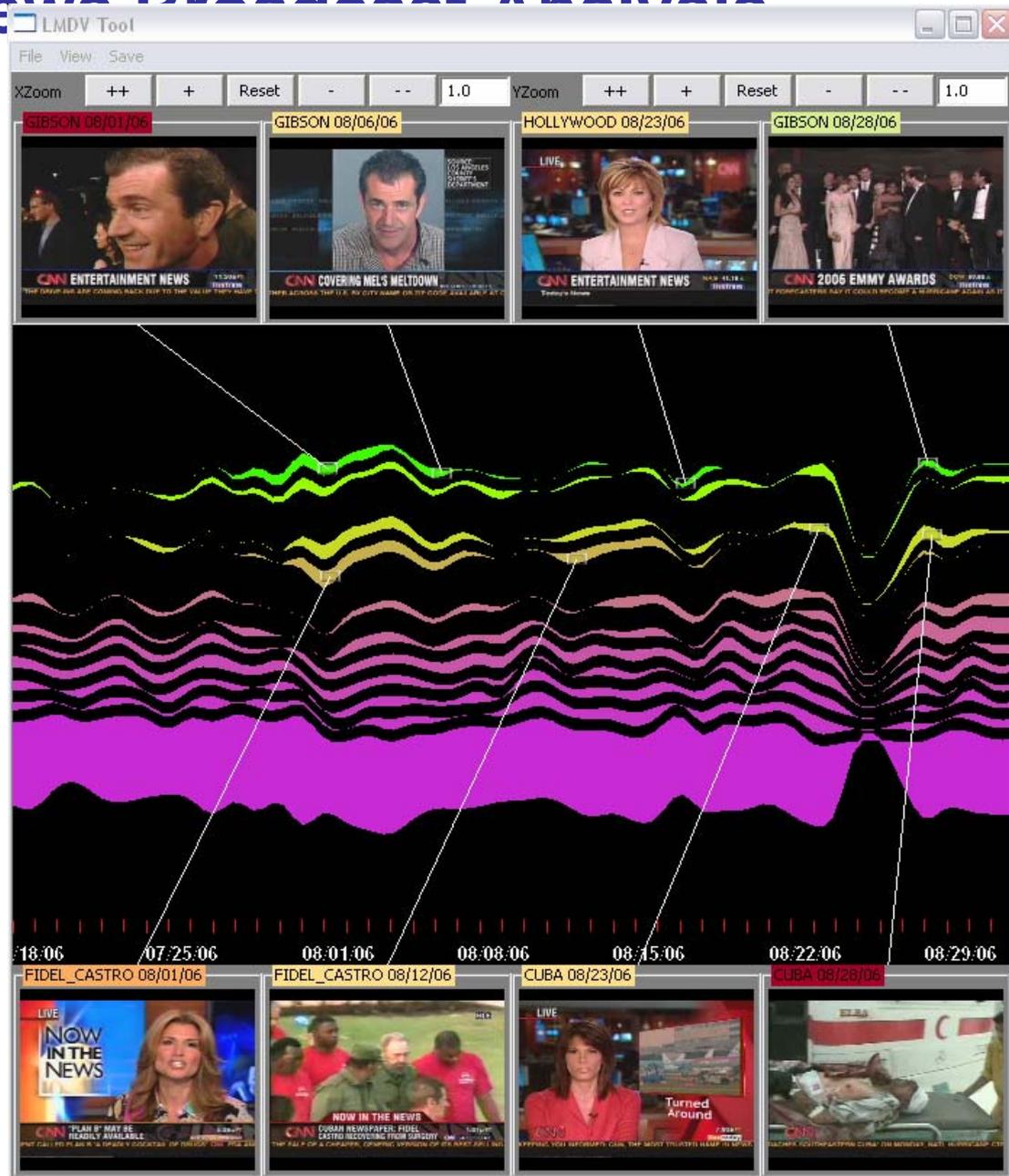


Multimedia: News Broadcast Analysis

Problem – How should we handle the stream of many different stories and themes over time?

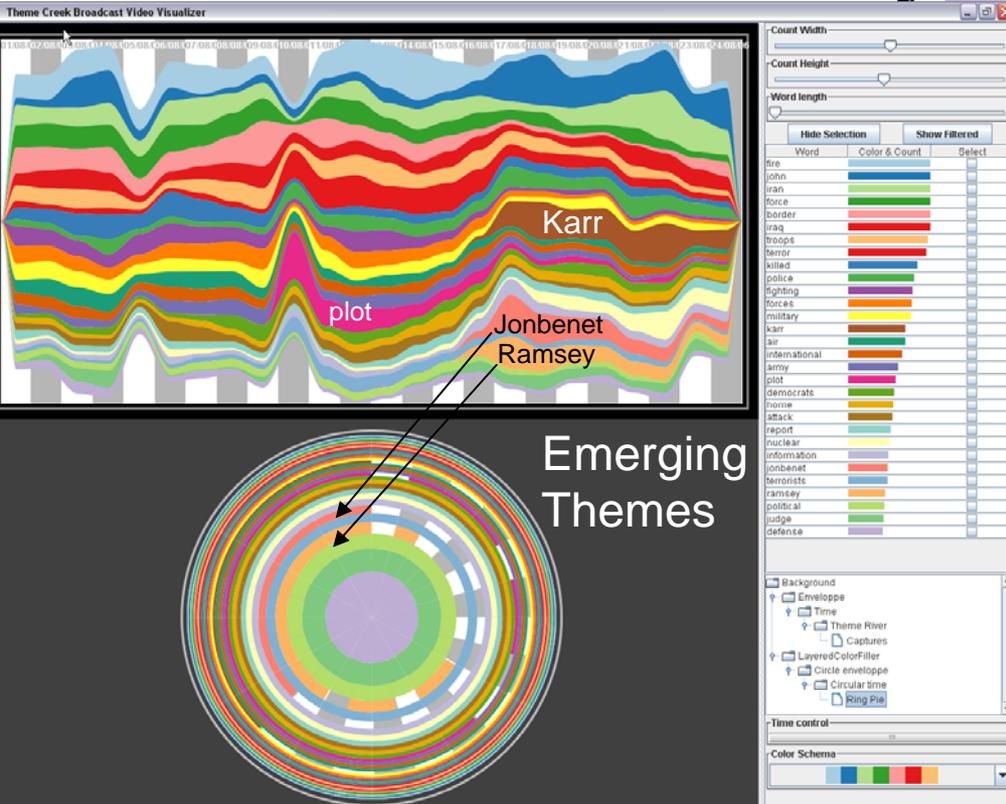
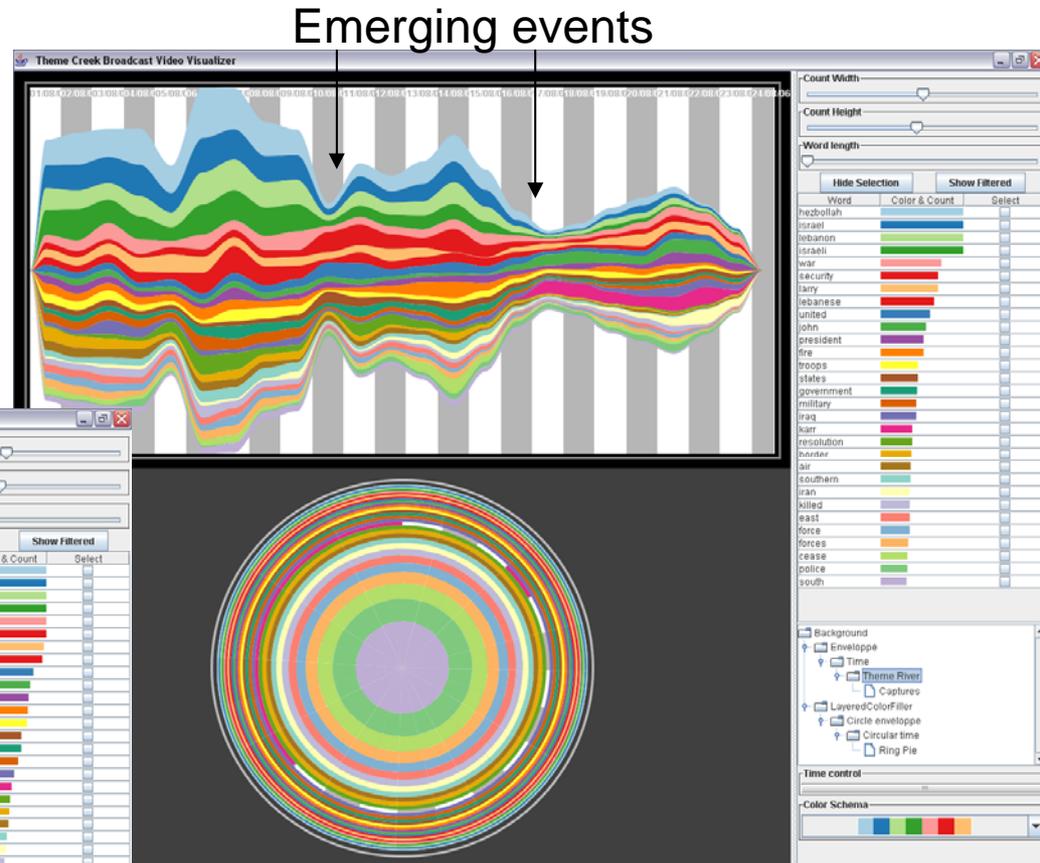
Solution –

1. Develop LensRiver and QueryRiver capabilities.
2. Develop highly interactive ways to explore themes and sub-themes, their interlinkages, and stories over time.



Multimedia: News Broadcast Analysis

Comparing themes and sub-themes for different channels



CNN (above) and Fox top 30 themes from 8/1 to 8/24/2006

Multimedia Visual Analytics: Open Issues

- Can we merge image and video analysis?
- Can we fuse with text analysis?
- Can we create concept and semantic structures that bring in and interlink structures from all media?
- Can we provide highly useful and efficient exploratory visual interfaces for all these?
- How can we apply these or Web or other multimedia document collections?
- *Have we found what we want to know, and have we found what we should know.*



With These Tools, There Is Much That Will Be Done (Some of Which Is Underway Already)

- **All the news. High value content from official and “semi-official” news sources at all levels.**
- **Identification and tracking of events and themes.**
- **High quality knowledge structures over time.**
- **Analysis of different viewpoints, different opinions based on origin of story, what is being talked about, who is talking, etc.**
 - **Local vs. national**
 - **Different broadcast styles (e.g., Fox vs. CNN vs. Al Jazeera)**
- **News at one level (e.g., local or for a foreign region) that is not being reported nationally or in other regions.**



Questions?

www.srvac.uncc.edu

