

# PERSONALCASTING

## Tailored Broadcast News

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### INTRODUCTION

Increasing sources and amounts of information challenge users around the globe. Broadcast news sources and newspapers provide society with the vast majority of real-time information. Unfortunately, cost efficiencies and real-time pressures demand that producers, editors and writers select and organize content for stereotypical audiences. In this paper we illustrate how content understanding, user modeling, and tailored presentation generation promise personalcasts on demand.

### NEWS ON DEMAND

People are daily offered vast quantities of news in the form of multiple media (text, audio, video). For the past several years, a community of scientists has been developing news on demand algorithms and technologies to provide more convenient access to broadcast news (Maybury 2000). Applications promising on-demand access to multimedia information such as radio and broadcast news on a broad range of computing platforms (e.g. kiosk, mobile phone, PDA) offer new engineering challenges. Systems have been developed that automatically index, cluster/organize, and extract information from news. Synergistic processing of speech, language and image/gesture promise both enhanced interaction at the interface and enhanced understanding of artifacts such as web, radio, and television sources (Maybury 2000). Coupled with user and discourse modeling, new services such as delivery of intelligent instruction and individually tailored personalcasts become possible.

### BROADCAST NEWS NAVIGATOR

To illustrate personalcasting, we describe the Broadcast News Navigator (BNN). In our research, we have created a system that exploits video, audio, and closed caption text information sources to automatically segment, extract, and summarize news programs (Maybury, Merlino, and Morey 1997). Figure 1 shows the results of BNN responding to a user query requesting all reports regarding "Cuba" between 17 May and June 16, 2001. For each story matching the query, the system presents a key frame, the three most frequent named

entities within the story, and the source and date of the story.

### Figure 1. Automated Retrieval of Stories about Cuba

This, in essence, provides the user with a "Cuba" channel of information, personalizing the channel to their information interests. Moreover, the user can create arbitrarily complex queries combining key words, named entities (e.g., people, organizations, locations), source (e.g., CNN, MS-NBC, ABC) or time intervals (e.g., specific days, weeks or years). These queries result in selected video stories specific to their interest.

The user can then select any of the key frames to get access to details of the story, such as shown in Figure 2. In this presentation, the user has access to all of the people, organizations and locations mentioned in the story, an automatically extracted one line summary of the news (the sentence with the most frequent named entities), a key frame extracted from the story segment, and a pointer to the full closed caption text and video source for review. An empirical evaluation reported in Merlino and Maybury (1999) demonstrated that users could enhance their retrieval performance (a weighted combination of precision and recall) by utilizing BNN's

StorySkim and Details presentations. In addition to task performance, users reported user satisfaction (1 dislike, 10 like) of 7.8% (for retrieval) and 8.2% for mixed media display (e.g., story skim, story details).

### Figure 2. Details of some Cuba Stories

The system provides navigation support, so that the user can select named entities and find stories including them. Further, by employing a clustering algorithm, the system enables the user to select stories similar to the current story.

### USER MODELING AND TAILORING

The control flow diagram in Figure 3 shows a traditional search session in BNN. The user poses a query and

receives a story skim of the kind shown in Figure 1. The user then selects a story and is provided the details as exemplified in Figure 2. From this story detail, the user can simply review the summary and all named entities or explicitly choose a media element to display, such as the full video source or the text transcript. However, each of these user actions affords an opportunity for modeling user interest. User interest profiles can be created from explicit and/or implicit user input and then used to tailor presentations to the user's interests and preferences.

As shown in Figure 4, in BNN the user can explicitly define a user profile by defining simple keywords, or semantic entities such as individuals, locations, or organizations indicating their interest. They can also specify preferred broadcast sources to search (e.g., CNN, ABC News). This profile could easily be extended to indicate media type preferences for presentation (e.g., key frame only, full video, text summary). The user's interest profiles can be run periodically and sent to the requester as an alert or story skims or details like those shown in Figures 1 and 2. In addition to this explicit collection, an implicit method can build an interest model by watching the user session to track the user's query, selection of particular stories, and choice of media. The system could then build an interest model.

### **Figure 3. Traditional Searching using BNN**

Because the original broadcast news source is segmented into its component parts, key elements are extracted and others are summarized. This enables a system not only to select stories based on users content interest, but also to assemble them in the manner a user prefers. For example, the user could be presented with only key frame, with summary sentences, with people or place names or with the entire source. A natural extension of this work would be to add a feedback and collaborative filtering mechanism so that not only would the individual user's model modify with search, but the user could benefit from searches performed by others in a community.

### **Figure 4. User Modeling and Tailored Presentation**

## **FUTURE RESEARCH**

Many outstanding research problems must be solved to realize automatically created user tailored news. Important issues include:

1. *Instrumentation* of user applications to automatically log and infer models of user interest. With users increasingly learning, working and playing in digital environments, instrumentation of user interactions (e.g., Linton et al 1999) is feasible and has shown value. In

information seeking sessions, detecting selections and rejections of information provides an opportunity to induce individual and group profiles that can assist in content selection and presentation generation.

2. *Tailoring*. More sophisticated mechanisms are required to tailor content to specific topics or users. In addition to content selection, material must be ordered and customized to individual user interests. This will require methods of presentation generation that integrate extracted or canned text with generated text.

3. *Information Extraction*. Over the longer term we are working to create techniques to automatically summarize, fuse and tailor selected events and stories. This requires deeper understanding of the source news material beyond extracting named entities, key frames, or key sentences.

4. *Multilingual content*. Because news is global in production and dissemination, it is important to support access to and integration of foreign language content. This poses not only multilingual processing challenges but also requires dealing with different country/cultural structures and formats.

5. *Cross story fusion*. An important problem is not only summarization of individual stories but summarizing across many stories, possibly from difference sources or languages. This is particularly challenging when the sources may be inconsistent in content or form.

6. *Persistence/transience of interest profiles*. User information needs tend to change over time, with profiles rapidly becoming out of date. Monitoring user queries and story selections is one method that can address this problem. Generalizing from their specific interests can yield an even richer user model.

7. *Evaluation*. Community defined multimedia evaluations will be essential for progress. Key to this progress will be a shared infrastructure of benchmark tasks with training and test sets to support cross-site performance comparisons.

## REFERENCES

- Boykin, S. and Merlino, M. Feb. 2000. A. Machine learning of event segmentation for news on demand. *Communications of the ACM*. Vol 43(2): 35-41.
- Linton, F., Joy, D., & Schaefer, H-P. 1999. Building User and Expert Models by Long-Term Observation of Application Usage. In J. Kay (Ed.), *UM99: User Modeling: Proceedings of the Seventh International Conference* (pp. 129-138). New York: Springer Verlag. [Selected data are accessible from an archive on <http://zeus.gmd.de/ml4um/>]
- Maybury, M. Feb. 2000. News on demand: Introduction. *Communications of the ACM*. Vol 43(2): 32-34.
- Maybury, M., Merlino, A., and Morey, D. 1997. Broadcast News Navigation using Story Segments, ACM International Multimedia Conference, Seattle, WA, November 8-14, 381-391.
- Merlino, A. and Maybury, M. 1999. An Empirical Study of the Optimal Presentation of Multimedia Summaries of Broadcast News. Mani, I. and Maybury, M. (eds.) *Automated Text Summarization*, MIT Press.

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