Generation of Multimedia TV News Contents for WWW

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ABSTRACT

In this paper, we present a system we have developed for automatic TV News video indexing that successfully combines results from the fields of speaker verification, acoustic analysis, very large vocabulary video OCR, content based sampling of video, information retrieval, dialogue systems, and ASF media delivery over IP. The prototype of TV news content processing Web was completed in July 2003. Since then, the system has been up running continuously. Up to the date when this message is written (March 27, 2006), the system records and analyzes the prime time evening news program in Taiwan every day of these years, except a few power failure shutdown. The TV news web is at http://140.113.216.64/NewsQuery/main.asp

Categories and Subject Descriptors

H.3.5 [**INFORMATION STORAGE AND RETRIEVAL**]: Online Information Services – Commercial services, Data sharing, Web-based services

General Terms

Documentation, Design, Experimentation, Human Factors

Keywords

TV news, video OCR, information retrieval, content analysis.

1. THE EMERGENCE OF WEB TV NEWS

The fierce competition among TV news programs make the news contents become more and more fruitful. However, people may not be patient enough to wait for the arrival of favored news events while a long series of uninterested TV news are on the air. Therefore, news on-demand becomes an attracting service [1]. Since, some TV news programs are broadcasted around the clock, manually indexing news video into Web contents can be a boring and tedious work. Therefore, automatically indexing news stories becomes an emergent issue for multimedia information processing. Increasing computing power and gradually maturing multimedia technologies provide a powerful working environment for automatically segmenting news video into semantically meaningful units such as stories and summaries, and then into hierarchical contents.

2. GOALS OF THE SYSTEM

In general, an automated hierarchical TV-news web system needs to have at least the following features:

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- ♦ Segmenting a TV news program into story based units
- ♦ Generating keywords and titles for each news stories
- ♦ Interactively displaying hierarchical TV news contents
- ♦ Providing users for searching related news stories.

3. SYSTEM DESIGN

The proposed hierarchical news content processing system consists three modules: (1) TV news acquisition, (2) news content analysis, and (3) user interface for news query and search. The major task of the acquisition module is to record TV news programs in proper video format, and fetch related news documents from Internet web. Content analysis module receives and segments the recorded news video into news story units, and then extracts keywords and news titles from each story. Providing a friendly searching and browsing environment for retrieving interested news is the task of user interface module. Figure 1 shows the architecture and data flow of the proposed TV news indexing system.

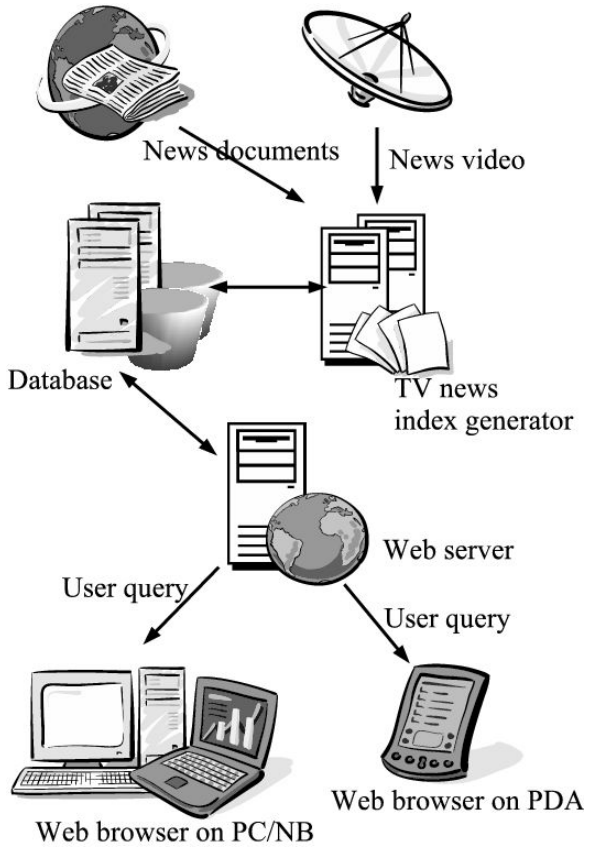

Figure 1. The architecture and data flow of the proposed TV news indexing and browsing system.

The most technology intense part in the proposed web system is the TV news index generator [2]. Figure 2 depicts the processing flow of the indexing generator. At first, a TV news program is captured and encoded into stream video. In the meantime, a shot detector is used to segment the streaming video into shots for key-frame generation. Within a shot, speaker identification techniques [3] are then applied to detect anchor frames. Each closed caption on the anchor frames is then extracted and recognized by video OCR techniques [4]. By matching the characters from closed caption with news document retrieved from Internet, the proposed system can construct links between TV news stories and Internet news stories.

4. SYSTEM IMPLEMENTATION

A prototype of the multimedia TV news WWW has been implemented on *1+N* personal computers, where *N* is the number of TV News channels. The database and web server are installed in one (*1*) machine, called WebDB. The rest *N* PC's are called Indexers, which are used to generate news index, key frames, etc. All these PCs contain a Pentium III or higher grade CPU, with at least 256 MB of RAM. In addition, a database server is installed in WebDB as a news data manager. The Indexer automatically records prime time TV-news programs every day, and in the mean time, segmenting and indexing news stories are also processed in parallel. Then, the Indexer produces hierarchical news contents, include news video, keywords, titles, and time code of a story.

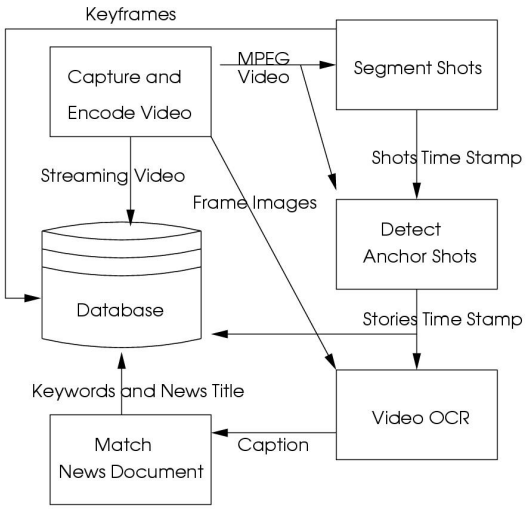

Figure 2. The flow of TV news indexing generation.

5. SYSTEM DEMONSTRATION

A snapshot of the TV news browsing results is shown in Figure 3. A user can select a particular or a favor channel and dates at the pull down menu. Then, click the *browse* button to start the browsing processes. The lower-left panel will show the news titles of the selected TV program. Key-frames of each news story are shown at the lower-right panel at the same time. (S)he can select an interested news story by clicking on the news title, or on a key-frame, to activate the playing of the corresponding video clip and the displaying of the key-frames of the selected news story. In addition, keyword query is also available in the user-interface window.

6. CONCLUDING REMARKS

The prototype of the TV news WWW was completed in July 2003. Since then, the system has been up running continuously. Up to the date when this report is written (March 27, 2006), the system records and analyzes CTS evening News program daily, except a few short shutdown due to power failure. Recently, we have setup a new WWW site, http://140.113.216.64/NewsQuery/PDA.asp for PDA browsing.

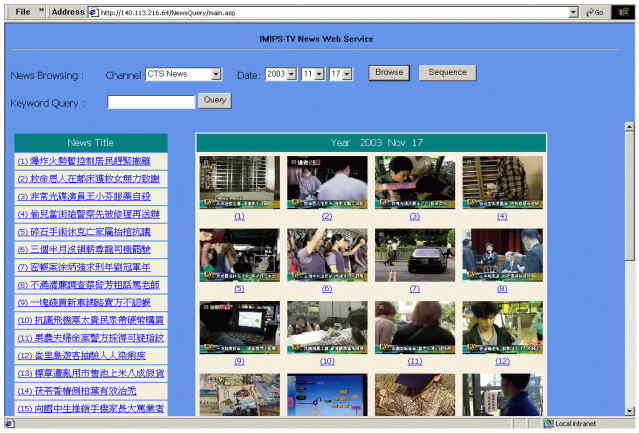

Figure 3. A sample of the TV news web-page.

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