Multimedia TV News Browsing System

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Abstract— In this demo, we present a system we have developed for automatic broadcast-quality video indexing that successfully combines results from the fields of speaker verification, acoustic analysis, very large vocabulary caption character recognition, content based sampling of video, information retrieval, dialogue systems, and ASF media delivery over IP. The prototype system of this demo is available at *http://nn.csie.nctu.edu.tw/Project1-1/intruduction.htm*.

I. THE EMERGENCY OF TV NEWS BROWSING SYSTEM

THE fierce competition among TV news programs make the news contents become more and more fruitful. However, people become less patient to wait for their favored news stories. Therefore, news on-demand becomes an attracting feature. Since, TV news were generated around the clock, manually indexing news video can be very heavy load labor work. Therefore, how to index news stories automatically becomes a critical issue. Increasing computing power and matured multimedia technologies provide a powerful workspace that can automatically segment news video into semantically meaningful units such as stories and summaries, and derive a content hierarchy.

II. SYSTEM REQUIREMENTS

IN general, an automated hierarchical TV-news indexing system needs to provide the followings:

- Retrieve necessary news information, e.g., news video for web-browsing, web news texts for content analysis, etc.
- Segment news program into story based units.
- Generate keywords and titles from segmented stories.
- Search news stories by keywords, dates, etc.
- Associate relative news series.
- Provide user interface for searching and browsing news stories.

III. SYSTEM DESIGN

BASED on the requirements mentioned in Section II, we designed the proposed hierarchical news indexing system. This system consist three major modules: (1) data acquisition (2) data analysis, and (3) user interface. The major task of the data acquisition module is to record TV news programs in proper video format, and fetch relative news documents from Internet web. Data analysis module receives and segments the recorded news video, into story based units, and also generates keywords and news titles for each story. Providing a friendly searching and browsing environment for
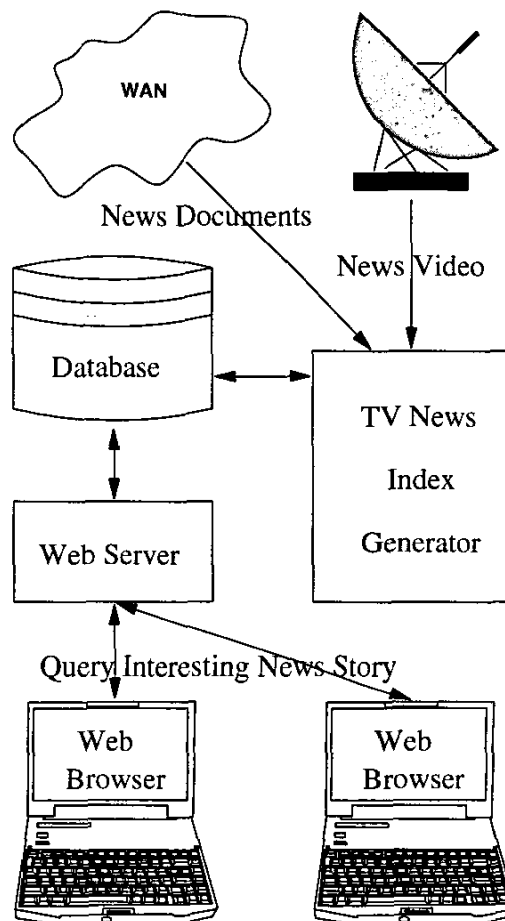

Fig. 1. The architecture of proposed TV news indexing and browsing system.

interested news by using news title and keywords is the task of user interface module.

Figure 1 shows the architecture and the flow diagram of proposed TV news indexing system. The system records news video and fetches news documents from cable or antana and Internet respectively. The TV news video is segmented into news stories first, and then keywords are extracted from closed caption. And finally, these information is stored in a database. Index processing are performed repeatedly every day, when TV news programs are broadcasted on the air.

The most technologies intense part in the proposed system is the TV news indexing generator. Figure 2 shows the processing
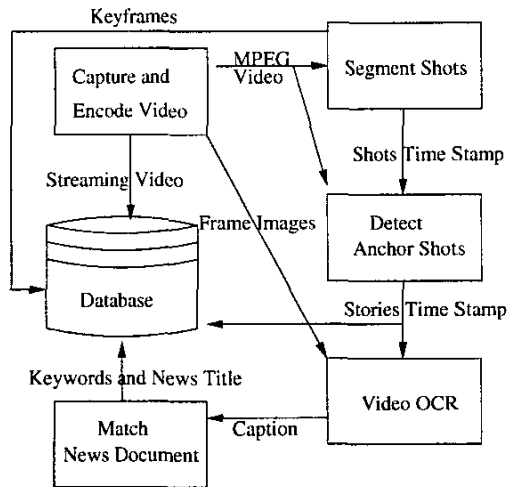
Fig. 2. The flow chart of TV news indexing generation.

flow chart of the indexing generator. At first, A TV news program is captured and encoded into stream video format. The recorded streaming video is then stored in database and is ready for user retrieving. In the meaning time, a shot detector is used to cut streaming video into shots for generating keyframes. With these segmented shots, speaker identification techniques are then applied to detect anchor shots. Each closed caption on the anchor shots is then extracted and reconized by video OCR techniques. Matching the characters form closed caption with news document fetched from internet, the proposed system can construct links between TV news stories and Internet news stories.

The more detailed descriptions of index processing steps are listed as follows:

- Automatically record TV news program in necessary video format (ASF)
- Segment news video into shots
- Merge segmented shots into news stories by speaker identification
- Extract closed caption characters from frames using using Video-OCR
- Generate keywords for each news stories
- Link each news story with textbased news available at other News web

IV. SYSTEM IMPLEMENTATION

THE whole system is implement in two PC based computers. The database and web sever forTV news browsing are installed in one machine, called WebDB. And the other PC (Indexer), is used to generate news index, key frames, etc. The detail equipments of these two PC are listed below:

	WebDB	Indexer
CPU	P3 800	P4 1.8G
RAM	128MB	256MB

In addition, a MS-SQL Server are installed in WebDB, and is used as a database. The UI web-page is setup over web-server IIS at this machine, too. By using DirectShow package, the Indexer records a TV-news program from 19:00 to 20:00 every day. After the recording of TV-daily-news is finished, several programs, written in C++, are executed to segment and index news stories.

To sum up, the Indexer produces news data, include news video, keywords, titles, starting time of story, and duration of story, at first. Then, all these data are stored in the database of WebDB. Therefore, users can query these stored TV news information via the UI web-page any time at their convenience.

V. SYSTEM DEMO

A snapshot of the TV news browsing results is shown in 3. A user can select a particular or a favor channel and dates of a TV News first on the top pull down manu. Then, click the *browse* button, to start the browing processes. The lower-left panel will show the news titles of the selected TV program. One keyframe of each news story are shown at the lower-right panel at the same time. User can select an interested news story by chicking on the news title or on a keyframe. After clicking the title of desired news story, the bottom-right panel will show the keyframes of this news story, and in the mean time, the news video of this story will be played automatically. In addition, keywords searching is also available in this user-interface page.
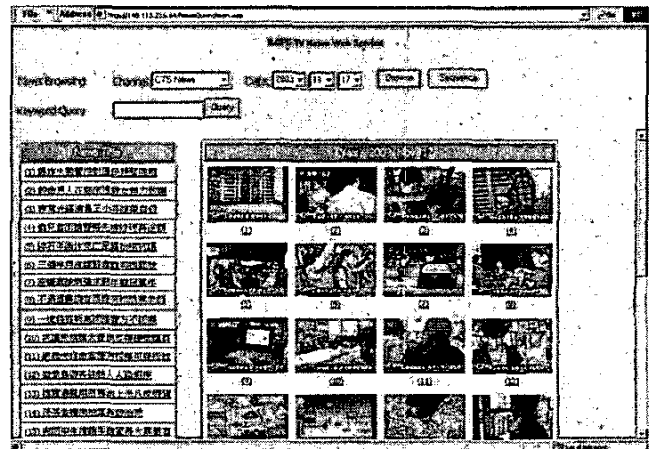

Fig. 3. User interface of the proposed TV news browsing system.

VI. CONCLUDING REMARKS

THE protype TV news browing system was finished in July 2003. Since then, we have powered up the system, and let it runs all the time. Up to the date (Dec. 4, 2003) we write this report, the system is working properly, except a few times of power failure. The web is setup at *http://nn.csie.nctu.edu.tw/Project1-1/intruduction.htm* for testing. Comments and suggestions are more than welcomed.