Interface Design for MyInfo: a Personal News Demonstrator Combining Web and TV Content

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Abstract: This paper describes MyInfo, a novel interface for a personal news demonstrator that processes and combines content from TV and the web. We detail our design process from concept generation to focus group exploration to final design. Our design focuses on three issues: (i) ease-of-use, (ii) video summarization, and (iii) news personalization. With a single button press on the remote control, users access specific topics such as weather or traffic. In addition, users can play back personalized news content as a TV show, leaving themselves free to complete other tasks in their homes, while consuming the news.

1   Introduction

For many years television has provided rich content, delivering news, information, and entertainment. More recently the web has developed as a rich content source. For the last several years many companies have talked about TV/web *Convergence*, but so far very few applications have been developed to link these structurally different media. Television provides linear content that is expensive to produce and is intended for a wide audience. The web offers interactive content that can be searched and indexed as opposed to TV Guide browsing. It is generally much less expensive to produce, allowing it to be customized for smaller groups of people. Can these two media really be fused together in order to improve the users' experience? The goal of our project was to develop a pilot convergence application that improves TV viewing by augmenting the content with data from the web. We presented our demonstrator of this pilot application at TV conventions in order to begin a dialogue with broadcasters and cable providers about how our technology could create new services for their viewers.

At a high level, we wanted to explore how linking, personalizing, and reformatting content from these two media could bring value to users. We call this research direction *Content Augmentation*. As an example: Imagine a viewer is watching a TV news story about Brazil. Because TV is expensive to produce and broadcast time within a single channel is limited, the content creators can only play a short story of around two minutes. After watching the story, a viewer may wish to know more about Brazil. A content augmentation application could understand that the news story is about Brazil and provide the viewer with appropriate, digested, and targeted information as well as references (e.g. web links) for further exploration. In addition, this application could employ a profile, personalizing the web content by prioritizing the links. This application is a great advancement over existing Personal Video Recorders (such as TiVo) or the personalized Web pages where the sources are limited to one medium and personalization is quite narrow.

As a proof of concept, we developed a pilot application/demonstrator. We wanted a demonstrator in order to begin a conversation with both users and with the content creation industry. A demonstrator would give both groups something to react to better measure both user needs and industry concerns. We began by producing several concepts and testing these with a focus group. Based on the group's

reaction, we designed and implemented a personal news application and demonstrated it at TV and cable expos. Our demonstrator collects individual stories from TV news and extracts news data from the web. It chunks individual stories into predefined content zones and prioritizes them based on a user profile and on cues indicating news priority from the broadcaster's point of view. Users can select individual stories or they can watch a complete personalized news show. The design focuses on (i) creating an interface that is easy to use, (ii) summarizing TV news so users can easily select or skip individual stories, and (iii) personalizing the content. This paper documents our concept and design of a pilot content augmentation demonstrator we call MyInfo.

2 Related Work

Related user interface work falls into three categories: personal news, video summaries, and convergence products. Personal news includes: an exploration of user needs (Manber et al., 2000), a personal news system for TV (Dimitrova et al., 1999), and personal-multimedia news retrieval (Light et al., 2002). Video summaries include: Informedia's video skims (Christel et al., 1998) and text research (Christel et al., 2001), Microsoft Research's video browser (Li et al., 2000), and Video Scout interface (Zimmerman et al., 2001). Convergence products include: Microsoft's UltimateTV and ABC's Enhanced TV.

Yahoo's research on Web personalization noted three challenges for large audiences (Manber et al., 2000). First, the interaction needs to be fast. Users will not wait any longer for personalized content than for regular content. Second, many users find the setup for personalization and customization to be difficult. Third, many web users do not understand why they would want to customize or personalize content, and these same users may indeed not have a real need for personalization. MyInfo builds on their discoveries by using a client/server model with personalization at the client and by improving ease of setup.

The *Personal News Retrieval System* was prototyped in 1996 to test the feasibility of video broadcast filtering in the news domain (Dimitrova et al., 1999). News broadcasts from different channels were semi-automatically indexed on a server. A client application invoked from a Web browser allows users to search individual stories. Searching is based on anchorperson, broadcaster, category, location, top-

stories and keywords. MyInfo builds on the video segmentation and indexing technology developed for this project.

Mitre's Broadcast News Navigator allows users to query for news information (Light et al., 2002). They evaluated how different presentations affected people's ability to identify, comprehend, and judge relevancy for segmented video news data. Like MyInfo, their system allows users to explicit define a user profile. However, they have also designed but not implemented a method an implicit method that tracks queries and selections. Unlike MyInfo, they have not yet explored if real world users would want a query based system for video news access.

Carnegie Mellon's Informedia project (http://www.informedia.cs.cmu.edu/) offers a host of video interface tools. Two of these are of particular interest. The work on video skims offers insights into how to condense video into short, meaningful clips using both video and audio cues (Christel et al., 1998). Their research on the role of text in video storyboards (Christel et al., 2001) indicates a strong benefit from the addition of text to keyframes. The findings were that while users desire to have the entire content in text, they gain efficiency by having short text summaries. Their storyboard work is quite similar to MyInfo text summaries of individual news stories.

Microsoft Research has also been exploring video summarization tools (Li et al., 2000). A version of the Media Player offers users additional controls such as a selectable table of contents, pause removal, and time compression (play back that is faster than real-time with pitch control) was tested. The indication is that the use of individual tools is directly related to the genre of the accessed video.

The Video Scout project explored visualization and summarization of TV content (Zimmerman et al., 2001). The Video Scout interface presents users with graphical segmentation of talk shows illustrating separate program and advertisement segments. Each program segment offers an image of the dominant host/guest for the segment, their name, and summarized text, helping users find and select segments they wish to view. In addition, Video Scout allows users to quickly find individual jokes and musical performances within the talk show.

With respect to commercial products, Microsoft's UltimateTV has some of the most integrated features (http://www.ultimateTV.com/). Their personal video recorder (PVR) allows users to watch TV in a picture-in-picture (PIP) window while checking email or surfing the web. Additionally, users can get

interactive information on certain programs while they watch TV. An "I" or "W" will appear on screen if the currently viewed show contains related web pages or interactive content. Interactivity consists of playing along with game shows or viewing supplemental sport statistics.

Another popular commercial product is ABC's Enhanced TV (http://heavy.etv.go.com/etvHome/). Like UltimateTV, viewers can get supplemental information such as player statistics for football games, answer questions for game shows, and answer polling questions for talk and news shows. The interaction takes place on a computer displaying a webcast synchronized to the TV show. The current implementation requires users to divide their attention across two screens. Further, both UltimateTV and Enhanced TV are limited as the interaction must happen in real-time (during the live broadcast) and users cannot access particular segments of interest in the TV show.

In addition to these two commercial products, almost all broadcasters and all TV shows maintain related websites with supplemental information such as web news stories related to the TV news as well as, cast profiles and overviews for narrative shows.

3   Concept Exploration

We began the design of our demonstrator by conducting a brainstorming session that included engineers and designers with experience in video processing, web information retrieval, web design, and interactive TV design. Sixty concepts were generated and then organized using clustering and affinity diagrams (Beyer & Holtzblatt, 1998. Through this analysis, we reduced our scope to twenty concepts grouped under four main themes:

1. *Connecting*: Watch live TV so that users are connected with the world but don't have to watch all the time (watches for emergency alerts, etc.).
2. *Exploring*: Aid users in exploring beyond information in a TV program.
3. *Anticipating*: Collect data before users ask for it, anticipates user needs. (who's that actor? how many goals have they scored?)
4. *Summarizing*: Reduce overwhelming content to chunks users can manage.

Following concept generation, two focus group sessions were arranged to better understand what users might want from convergence applications. However, through out our design process, we kept in mind that this group represented the opinion of only a small set of users and did not necessarily map directly to the needs and desires of all users. Our focus group contained four men and four women living in the suburbs near New York City. They came from different educational, ethnic, and socio-economic backgrounds. All participants had access to the web either at work or at home; they all enjoyed watching TV and watched at least seven hours each week; and none of them owned or had used a PVR such as TiVo, capable of storing many hours of TV on a hard disk. We decided not to include PVR users, because we did not want their familiarity with current PVRs to limit ideas about what might be possible.

In the first focus group session participants reviewed and prioritized the different concepts (see Figure 1) and offered feedback on if and when they might use a specific application. Much time was spent exploring specifically how they preferred to access information and how and when they preferred to watch TV. Three concepts received particularly high ratings from participants:

1. Personal news application that combines news from the web and TV.
2. Actor information application that displays biographies and filmographies extracted from the web for actors in a movie that the user is currently watching.
3. Documentary explorer application that allows users to explore web documents directly related to a documentary they are currently watching.
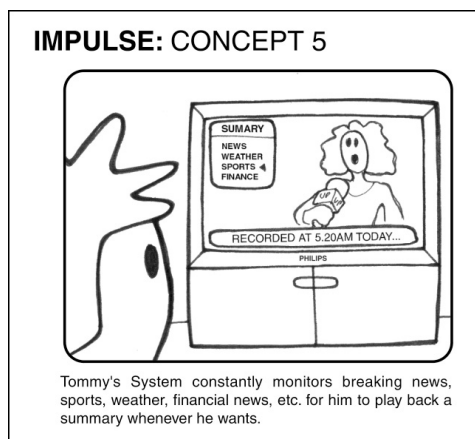

Figure 1. Concept drawing presented to focus group

The second focus group brought back the same participants two days after the first session and used participatory design approach to help flesh out the

personal news concept. We chose to invite the same participants because they were now familiar with the content augmentation, and by involving them we could more efficiently build on the knowledge they had acquired. Participants explored the personal news scenario, asking themselves when and where they might want to use such a system. In discussions with each other, they decided they wanted a system that provides news with a single button press. They wanted to use it (i) in the morning in their kitchens as they make breakfast and prepare for their day; (ii) again in the kitchen when they are just getting ready to go out the door to see the latest weather and traffic, and (iii) in the evening in their bedrooms for an overview of the days events and for planning.

Participants asked that the system collect information on weather, traffic, financial news, sports, local events, and topics of interest. They all thought that although this information is available from the web, it took too much time to retrieve it. To get this information they needed to go upstairs, boot their computer, connect to the Internet, and then use a search engine to find what they wanted. Also, they found the personal web services such as myYahoo too laborious to set up even though none had ever tried one. Their current approach for getting this kind of content was a method we labeled "niche surfing". They would tune their TVs to different niche news channels such as CNN for national news, ESPN for sports, and CableVision channel 12 for 24-hour local news. Once tuned to the correct station, they would wait for the information they wanted to play, which they indicated was usually only a few minutes. In addition, the TV format of the news offered them a level of entertainment, which helped relieve the tedium of their maintenance tasks such as cooking, folding laundry, etc.

With respect to the personal news concept, the subjects generated four requirements:

1. Access to the information must be immediate. If they had to wait for it, they would simply surf to another TV channel for the information they wanted.
2. Information needed to feel fresh. If the content seemed canned or old, again they would revert to looking for information from live TV.
3. The system needed to be mostly hands free so they can consume the news while doing other tasks.
4. The interface needed to be simple and fast. They want to "get in and get out". They want to know what the weather is before

they leave and they don't want to navigate through several screens to get to it.

What the participants identified as essential was a news system that could provide the news they wanted when they wanted it. They did not have any great interest in exploring specific topics, which was quite a surprise to the research team. We initially expected the TV content to be a stepping-stone to deeper exploration via the web. However, our participants requested a system that collects high-level personalized data from the web such as the current temperature, selected stock prices, traffic information, etc. and then in addition, provides clips from TV news for additional detail.

4 MyInfo System

The MyInfo system architecture includes a server and a client (Figure 2). The server segments the TV news into individual stories and infers news priority from the broadcaster's point of view. Metadata describing each story is then sent to the client, a settop box. The client stores the news from channels selected by the user. It then uses the metadata and the user profile to prioritize the individual stories. The client also extracts and stores specific information from the web requested by the user. Users access the system using a remote control and see data displayed on their TV. For more details on the system please see (Haas et al., 2002 and Janevski et al., 2002).
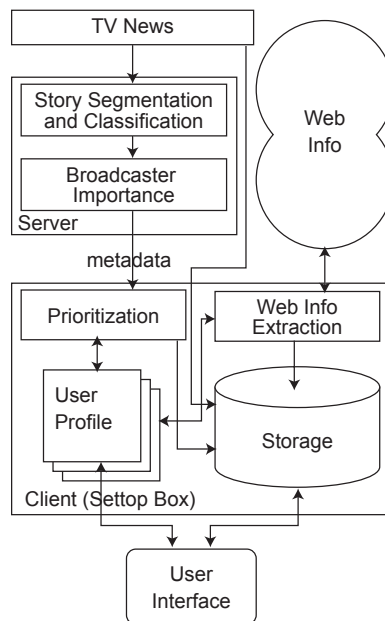

Figure 2. System overview

5 Interface Design

Following our participants' request, the MyInfo demonstrator allows users to access the latest TV and web news and information with a single button press. The application organizes the content into individual stories classified into six different content zones: Weather, Traffic, Sports, Financial News, Headlines, and Local Events. The first story in each zone contains the personalized content extracted from the web. A prioritized listing of the TV news stories then follows.

5.1 Ease of Use

We selected a remote control for user interaction because it is generally available, familiar for TV and inexpensive. Our prototype uses a Philips Pronto remote, with a customizable touch-screen, but the design could easily work with a more traditional (no touch screen) remote control. The first remote screen presents users with a MYINFO button and the six content zone buttons (Figure 3). Pressing the MYINFO button transitions the TV to a summary screen, showing highlights from all of the content zones. Pressing any of the content zone buttons displays the personalized content for the selected zone.

The "PrvΔ" and "NxtΔ" buttons allow users to navigate up and down the list of stories. The "‖ >" button allows them to play and pause TV clips. The "> All" button (appears as a play triangle with the word All to the right) allows them to play back all of the clips in the selected zone. In the case of the summary screen, which shows highlights from all of the zones, pressing the "> All" button begins a play back of all stored TV news stories. This action allows users to play back a complete, personalized newscast, leaving them free to continue with maintenance tasks such as cooking, etc. When "> All" is active, users can also use the "PrvΔ" and "NxtΔ" buttons to replay a story or skip a story they do not find interesting. The ability to skip a story can greatly improve the TV news experience; users are no longer trapped viewing stories they do not care about.

Figure 3. .Remote control screens

This expanded version of a TV news story displays the video clip playing at the top.

Bottom of expanded story displays duration and location within the broadcast.

Collapsed stories display as a prioritized listing.

This collapsed story in the fixed-highlight position (indicated by background color and reversed text) mirrors the expanded story on the left.

Figure 4. Headlines screen with highlight on TV news story

We divided the content zone screens into two halves (Figure 4). The right side of the screen displays "collapsed stories": a list of current story summaries sorted by priority. We chose to use a fixed-highlight, indicated by the reversed text and golden background. The fixed-highlight in the second position allows users to always see what they are selecting when they navigate up (PREVIOUS button) or down (NEXT button). This feedforward approach where users can always see what they are selecting is strong recommendation from Jef Raskin in *The Humane Interface* (Raskin, 2000).

Users can get both an overview of many stories and the details of a single story on the same screen. The left side of the screen displays an "expanded" version of the highlighted story. When the highlighted story is from the web, the expanded story contains text and related images layout for easy consumption (Figures 5, 6, 7). When the high-lighted story comes from TV, the expanded story contains a video clip that immediately begins playing (Figure 4) thus reducing the number of button presses.

The individual content zone buttons simplify and speed up the use of MyInfo. When users need content from a single zone, such as checking the traffic before they leave home, they press a single button. The NEXT and PREVIOUS buttons simplify the selection and skipping of individual stories without additional interface complexity. Finally, the PLAY-ALL button allows users to view MyInfo in the same way they currently watch TV news. Users can get the information they need while leaving their hands and often even their eyes free to complete other tasks.

5.2 Video Summaries for Browsing

One of the main interface design challenges was creating selectable video summaries that quickly communicate both the type and value of the content. Users needed to be able to quickly decide if they should select or skip a story. In addition, even though the TV news stories are individually selectable, we wanted the summaries to reinforce that the content comes from TV instead of just making the interface look like a web site. By seeking a more TV look and feel, the interface builds on the familiar experience people have with TV news.

The collapsed story summaries on the right side of the screen consist of an image, a label indicating the content source, and a textual summary. For web stories, the images are predefined by the system and the text comes from the extracted data. For TV stories, the image is a representative keyframe and the text summary is generated automatically from the closed captions (Figure 4). In order to select an image, MyInfo segments the TV story into anchor segments and reportage segments. It then divides the reportage segments into uniformly colored segments and automatically selects a frame that is most representative of the video. The clear advantage of using reportage images is that they offer more insight into the content of a story than an image of the anchor talking.

When expanded, the TV news stories display additional summary information on the left side of the screen (Figure 4). A colored rectangle indicates the position and length of the individual story with respect to the TV news broadcast. Users can use the length to decide how much detail they will get from an individual story. Longer stories indicate more detail. The amount of detail can help users select between several stories on the same or related topic. The position can also be of value as broadcasters like to place the most "important" stories at the beginning and end of a broadcast. In addition to a visualization of length and position, the expanded story summary indicates when the story was recorded, which helps users decide the "freshness" of a story.

6   Personalization

Personalization provides one of the greatest benefits of the MyInfo demonstrator. However, it is also one of the greatest risks. Users must feel they are in control or they will not purchase or use a product. MyInfo personalizes the news in two ways. For the web data, user can specify the content they want by placing requests in their profile. For TV news stories, the application prioritizes individual stories within a content zone based on both topics of interest listed in the user profile and on cues broadcasters use to indicate the importance of a story.

In designing the personalization of the web content, we focused on providing users with maximum information with minimal input. For weather, users input their zip code and the system extracts the current conditions and four-day forecast for their specific location (Figure 5). For traffic, the profile contains their home address. In addition users select a set of destinations, other towns or prominent structures such as malls, stadiums, airports, etc., and hot spots (items like bridges and tunnels that notoriously have traffic delays). Once selected, the system goes out on the web and extracts traffic information on the specific hot spots and on the

major roads between the users home and the selected destinations (Figure 6). For sports, the system allows users to select the sports they wish to follow and then select individual teams. As a default, based on the home zip code, MyInfo begins to track the teams in the local area. When users select the sports zone, they see the latest scores and upcoming events for the monitored teams (Figure 7). For financial news, the profile contains the names of indexes, stocks, and mutual funds they wish to track. The system then extracts the latest prices for these items. For local events, the profile contains a set of keywords describing events they like. The system then prioritizes a list of local events based on their distance from the user's home, match to the keywords, and how soon the event will happen.
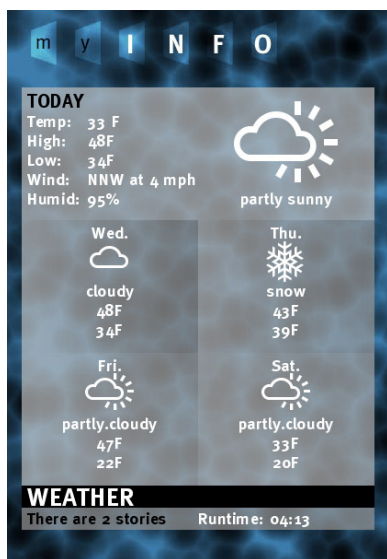
Expanded stories containing web extracted data
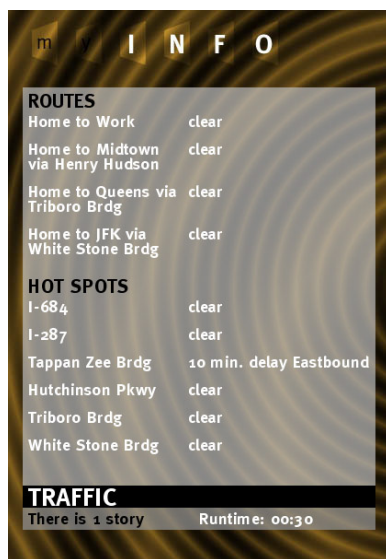

Figure 5. Weather from web

Figure 6. Traffic from web

Figure 7. Sports from web

Personalization of web and TV content improves the traditional TV news experience in two ways. First, it makes it faster for users to get the information they want. If users want to know the current temperature or a stock price, the information is one button push away. Users don't need to surf to a channel and wait for the story to play. Second, personalization adds relevance. For example, local TV news can only devote a few minutes to traffic. This prevents them from discussing all problems. Often, they skip a user specific route. MyInfo's web story offers personalized routes while allowing users to see TV traffic news for an overview.

MyInfo prioritizes TV stories. The system balances user specified topics with cues indicating a story's importance. Users have no way of predicting every kind of news story that might be important to them. They may know they are interested in China; however, it is hard for them to predict major events such as earthquakes, elections, etc. By allowing the broadcasters' editorial content decisions to play a role, users gain a much better information mix.

MyInfo infers the broadcaster's point of view of a story's priority by examining three characteristics: (i) story duration, (ii) story position within the newscast, and (iii) use of a teaser. Story duration is an obvious indication importance. Since broadcast time is limited, more time equals more importance. Position and use of a teaser are subtler. The most important TV news stories generally appear at the beginning of a newscast. However, broadcasters place other stories they think many users want to see at the end. They then use teasers, telling users that an interesting story is coming up, to keep them from switching to another channel.

MyInfo helps users feel in control by allowing them to select the information they want extracted from the web and enter keywords (topics of interest) for the TV news.

7 Conclusion

Using TV news footage provided to us (from CableVision local channel 12 and from CNN Headline News) and web pages from various sources,

we implemented the MyInfo demonstrator in Java and used it to present both the concept and technology (video segmentation and indexing and web extraction technologies developed jointly between Philips Research and IBM Research). We demonstrated it at both the National Association of Broadcasters Expo 2002 in Las Vegas, NV and the SCTE Cable Show 2002 in San Antonio, TX. Reactions were very positive for both the technology and the personal news application. Many broadcasters and cable service providers were interested in how MyInfo could help them re-purpose their TV and web content into a new service. The challenges still remaining consist of developing a viable business model and issues of digital content rights.

MyInfo represents the first draft of a content augmentation application. The system integrates data from web and TV news. It is a step towards a seamless integration, and visualization of all content as stories and personalization of both the web data and the TV stories helps unify the user experience. MyInfo builds on feedback from our focus group sessions and provides users with news that is easy to access, fresh, personal, and formatted for TV.

7.1 Future Work

In the future we plan to work further on the seamless integration of various media. We plan to develop a synthetic anchor that can read web news. Also, we plan to use our demonstrator to elicit new ideas from users and to work with broadcasters on the development of appropriate business models. In addition, we hope to develop new interface concepts that allow the news from any source to be accessed from different devices such as TVs, mobile phones, and mobile computers.

8 Acknowledgements

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