

# PC applications conquer the TV domain

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**Abstract** — The share it! project provides a system that allows consumers to publish and distribute content to other consumers within a share it! peer-to-peer network. A number of related applications enable the end user to become content provider for family and friends or every other share it! user. All these applications running on an augmented MHP box utilize the TV screen for presentation purposes. This requires several considerations by the application designers which differ quite a lot from traditional PC programming with regard to the user interfaces.

**Index Terms**—home-to-home communication, the end-user as content provider, user interfaces.

## I. INTRODUCTION

THE integration of digital receivers for TV services with local storage devices and broadband connections opens the floor for a variety of new applications in a domain which was traditionally restricted to pure consumption of broadcast programs with light interaction possibilities like call-in programmes. Today watching TV is no longer a dead end for the end-user. The EU-funded IST Project share it! [1] develops a system which supports rights managed content sharing on peer-to-peer networks between homes connected by the broadband Internet. Share it! allows consumers to publish and distribute content to other consumers. The project builds on the Multimedia Home Platform (MHP) [2] and existing technologies of peer-to-peer networks as well as broadband connections. The share it! devices establish an authenticated connection to exchange rights information and metadata [3] to ensure that content is only distributed when rights allow it. In this way a network of trusted homes is established that allows the rightful and secure sharing of content.

Personal Video Recorders with local storage are already changing how people watch TV. The addition of the broadband Internet causes yet more change. The following scenarios illustrate some of what becomes possible:

- The basic use of the system – supported by the resident navigator of the share it! box – allows users to acquire all the content in the network and appropriate access rights in a relaxed, “lean back” way, to find the content they are interested in, and publish and distribute content to others. The challenge is to make

this as easy to use as traditional TV, and to make the control of copyright as transparent as possible to the consumer.

- Share it! technology encourages the development of groups of people sharing content on a common interest.
- Users can publish their own content either to the world at large or to a restricted group of friends and family, and they can annotate existing content and share it securely. Simple examples allow a user to share a photograph and a short text message with other users, or to chat about content on TV, or to create bundles of linked and annotated items to share in a group.

A number of applications which will be enabled by this technology within the traditional TV domain are actually well-known from the PC domain. However, these applications cannot simply be adapted from one domain to the other. Despite the fact that a TV set looks quite similar to a PC screen, the presentation capabilities and the habits of the typical users differ a lot. Ease of use, consistency and stability are three key requirements for successful home networking and corresponding applications. In order to achieve that the share it! applications have been developed in a cyclic development approach taking into account feedback from early usability tests with mock-ups. Application designers also followed a number of TV-specific guidelines and recommendations which are summarized in the following section. In section III an overview on capabilities and user interface issues for the resident navigator is given while section IV introduces selected share it! applications.

## II. TV-SPECIFIC USER INTERFACES

In the PC domain the area of user interface design is well understood. In contrast to that, user interface design for the TV domain is a new area of research which is often underestimated by traditional PC programmers. This dilemma is described in [4]. In the following a selection of TV-oriented guidelines for the development of interactive applications is provided. For more detailed guidelines which also cover general device-independent issues see [5].

- The users must be able to clearly identify all interactive elements (hot spots) and distinguish them

from other visual information that is not interactive.

- The remote control is an important interaction device for the TV user that can be designed either as a selecting device or as a pointing device. If the remote control is a selecting device, a focus is provided to navigate through the TV screen using the arrow keys (up, down, right, and left) on it. The focus indicates to the user the control on the TV screen where he can interact by using the keys on the remote control. In order to provide the user confirmation functionality, the remote control must provide an OK/Select button. If the remote control is a pointing device to gain spatial freedom the interaction design gets more complex and therefore should be avoided.
- While it does not matter how different interaction elements are placed on the screen when using a pen or a mouse, the navigation path from one element to the other should be obvious in case of remote control and use of cursor keys. The interactive elements should roughly be arranged along vertical and horizontal dimensions, so that the user can anticipate the movement of the focus according to the arrow keys used.
- Information chunks should not be too large. The entire information must be presented simultaneously on the screen. Scrolling shall be avoided on TV screens.
- The navigation between different information chunks is usually organized by a set of links. A consistent set of links should be provided throughout the different screens including a home link and a back link to the previous screen. The user should always have the option to leave the current screen with one key press on the remote control
- The information chunks which belong together should have the same consistent layout. Once chosen, a screen layout should be reused continuously.
- Give preference to larger fonts of at least 20 pixels
- Different font sizes should also be used carefully. No more than 3 font types and faces respectively should be used within one screen. The line width of the combined fonts should be similar.
- An italic font style should not be used due to the lack of legibility on the screen (especially when using smaller fonts).
- White background color should be avoided since it causes a flicker problem on the TV screen.
- The contrast between information and background should be enough. The biggest contrast has black text on bright background. Colored text on bright background has a reduced contrast, white text on dark background as well. In this case the font size and / or the letter spacing should be increased.
- Vertical flickering of TV lines has to be taken into account. Do not use layout details which are too fine.

### III. RESIDENT NAVIGATOR

The resident navigator of the share it! box is the key to the basic functionality of the system. This requires careful consideration of the user interface. The features offered by the resident navigator include access to broadcast channels and local content, the possibility to recommend content within the share it! network, search functions which seek for available content, access to special interest groups and the address book as well as customization of the user interface by means of the virtual channel and the user's favorites. The challenge of the interaction design was to integrate all these features into a consistent user interface which is easy to operate by remote control.

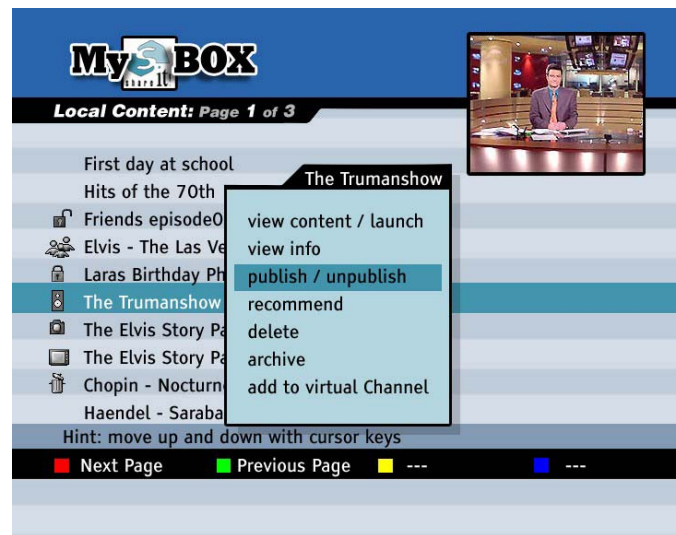


Fig. 1. Resident Navigator example screen

A consistent set of single remote control keys is used throughout all navigator screens for navigation purposes, to select a function, to go back to the previous screen and to the main menu and to open a pop-up menu which provides context-sensitive functions related to the currently selected item. Special functions are provided by means of colour keys which are explained on the bottom of the screen. Further, more content specific and context sensitive help is presented in a dedicated hint area.

Information is split into several screens if it does not fit onto a single one. The user always gets an indication on the number of related screens. While using the navigator the user can still follow a TV programme in PIP mode – if desired.

### IV. SELECTED APPLICATIONS

In addition to the resident navigator a variety of end-user applications can be downloaded from various sources. In order to avoid problems well-known from the PC domain the APIs which are accessible by third party applications are limited to a non-critical subset of the share it! functionality. Three selected applications which support the end-user as content provider for family, friends or every other share it!

user are briefly introduced below.

#### A. Downloading pictures from a digital cameras

Downloading and archiving pictures from a digital camera onto a PC is common practice. These pictures are also often sent to other users by means of email services. This is only practical for experienced PC users but not for your grandmother. In the TV area it is also quite common to connect a digital camera to a TV and watch a slide show being directly presented on the TV screen. However, the pictures remain in the camera's storage and cannot be further processed, especially sent to anybody. The share it! system introduces the complete PC scenario into the TV domain in a way which can even be handled by any inexperienced residential user, who is not used to PC technology.

The box provides an USB interface as known from the PC domain. As soon as the camera is connected the corresponding application is started automatically. It provides a picture viewer as shown in figure 2. This allows navigating through the pictures on the camera and selecting those which shall be stored locally and or sent to another share it! box. The last picture taken is shown first by default.



Fig. 2. Downloading pictures from camera

The picture which has the focus is shown in large scale as well as highlighted in the film strip below. Since the functionality of this application is quite limited with regard to the actions required from the end user, the user interface design is restricted to cursor keys and color keys. Navigation to previous and next images is done by means of cursor keys as in the resident navigator. Actions like selecting pictures, storing them and sharing them with other share it! users are provided by means of color keys. Selected pictures are highlighted with a yellow square which relates to the fact that pictures are selected with the yellow color key. If the user decided to send a picture, the local address book automatically pops up. Due to the limited functionality provided by this application, the user interface can be quite

simple.

#### B. Content bundling

The functionality of this application is much more complex than the previous one. It allows combining various content items into a so-called bundle. Users may collect content relating to a topic of their liking and bundle not only the raw content but also create a navigation interface similar to a DVD menu. A bundle can be used either for local archiving purposes as well as to publish it for others in the share it! community. Figure 3 shows the user interface of the BundleMaker. In the shown bundle the user has created four chapters representing different destinations. Each chapter consists of a number of pictures and videos presented in form of a slide show. New chapters may be added as well as additional content to existing chapters.



Fig. 3. The BundleMaker

The bundle description is combined with the content referenced in the bundle - at least that content for which the user has the necessary rights - and can be shared with other users. Content for which the rights are not owned by the user who produces the bundle are only referenced in the bundle. When the recipient of the bundle tries to view it by means of the corresponding BundlePlayer application, the property rights are checked and the user can either acquire the rights for the missing content or watch the presentation without it. The main challenge of the application development was to provide a user interface which is easy enough to be handled by a TV remote control, but also to provide enough functionality to attract the end user. The initial mock-up tried to compete with existing PC applications. However, usability tests have clearly indicated that the initial functionality was much too complex for the average TV user. Examples for functionality that has been removed as the result of usability tests from the transition of the initial mock-up to the actual application are arbitrary hierarchical structures and extensive influence of the end user on the layout.

### C. Annotation of streamed content

This application enables the user to include markers and annotations to streamed content which is stored locally either for his own purposes or to share it with other users. This application can be used for many different purposes and as such is rather a tool than a concrete application. Application scenarios include

- simple indexing of a movie to provide easy access to the main sections of interest, e.g. goals in a soccer game, the best jokes in a comedy, or favorite hits in a music show.
- a more detailed description of the purpose of each index by means of annotations utilizing additional text, audio or image content.
- individual subtitling of a movie.

Properties of individual markers do not only include a position within the movie but also the duration.

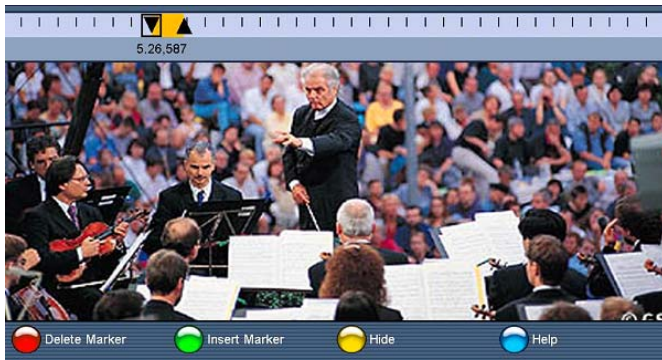


Fig.4: The annotation tool

While watching the movie the end user can insert the markers with a single key stroke on the remote control. After the movie is finished the user can navigate between the individual markers and not only modify their position and/or duration but add additional information such as images, life recorded audio annotations or text. The recipient of such an annotated video may watch it either in its original sequence with corresponding annotations automatically presented or he may skip from marker to marker. Only the color and cursor keys are used for navigation purposes. While in the PC domain one would allow the end user to present the annotations on the screen at arbitrary position, the TV version is restricted to five areas which are mapped on the color keys for easy access (see figure 5).

As well as the bundling application this application is provided in two parts: an editor that allows the user to add and edit markers and annotations, and a player that allows the recipient to watch the annotated content and navigate through the markers.

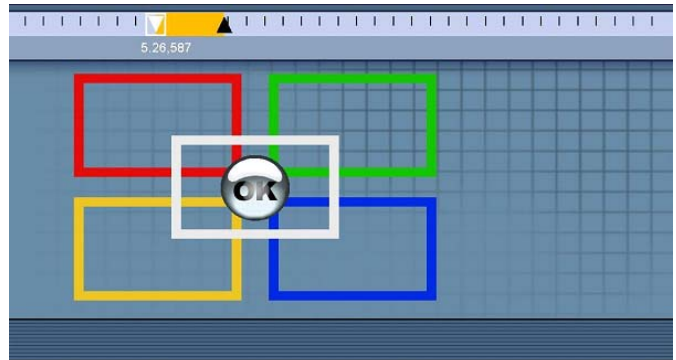


Fig. 5. Select the position of an annotation

## V. CONCLUSION

Integrating today's network and file-sharing technologies used for the PC domain with new standards of interactive television like the Multimedia Home Platform (MHP) and content related metadata into a new kind of Personal Digital Recorder (PDR), allows software developers to implement TV based applications, which are easy to use and rich in functionality.

To adapt applications from the PC to the TV world, a different interaction design, mainly influenced by lower TV resolution, limited input devices and consequentially different behavior patterns has to be adopted. Applications in the share it! network utilizing this interaction design allow consumers to publish and distribute content in a rightful way to other consumers within the peer-to-peer network.

## ACKNOWLEDGMENT

The authors would like to thank the European commission for supporting this work within the IST Program and also thank the members of the Share it! consortium for their co-operation and their contributions to this work. This includes the teams at Philips Research Redhill and Eindhoven, BBC, NDS, NOB, TNO-T, University of Linköping, University of Ljubljana, Fraunhofer FOKUS, and Elisa Corporation.

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