
Home Entertainment UI Continuum: Cell Phone, HTPC and iTV

Gil Barros

LSI-USP
Av. Prof. Luciano Gualberto,
Trav.3, no. 158
São Paulo, SP, 05508-900
Brazil
gil@lsi.usp.br

Julia Benini

LSI-USP
Av. Prof. Luciano Gualberto,
Trav.3, no. 158
São Paulo, SP, 05508-900
Brazil
jubenini@lsi.usp.br

Marcelo K. Zuffo

LSI-USP
Av. Prof. Luciano Gualberto,
Trav.3, no. 158
São Paulo, SP, 05508-900
Brazil
mkzuffo@lsi.usp.br

Abstract

There is an ongoing convergence of broadcast and communication networks, as well as the functionalities available in computers, communication devices and consumer electronics. This convergence, however, does not yet occur in the User Interface (UI) level, where each device has its own navigational style and incompatible input devices. It is expected that different devices should require different UIs, but there should be a level of consistency amongst these to facilitate the convergence of devices to the end-user. We call this the User Interface Continuum.

In this paper we verify the application of this continuum through an experiment where we use a Bluetooth-enabled cell phone as the remote control (RC) for a Home Theater PC (HTPC).

Keywords

User Interface, Interactive Television, Remote Control, Cell Phone, Convergence, Consumer Electronics, HTPC

ACM Classification Keywords

H.5.2 [Information Interfaces and Presentation]: User Interfaces--Interaction styles; Screen design; Input devices and strategies; J.7 [Computer Applications]: Computers in Other Systems--Consumer products

Introduction

During our research work for the Brazilian Digital Television System (SBTVD) one of our research topics was the convergence between Digital Television (DTV) and cellular phones and to which extent the User Interface in these 2 devices could be compatible. In an ideal situation their UIs would be the same, but considering that the form-factor of these devices is very different, as well as the focal task, that is not the case.

Nevertheless, their UIs should provide a continuum, in which they are consistent and share common elements in order to facilitate their interoperability and allowing the end-user to apply interface concepts from one domain into the other.

Related Work

Zimmermann [7] proposes an ANSI standard for the communication between a Universal Remote Console (URC) and a target device. The architecture includes abstract descriptions for the URC and the target device, as well as a general framework. A similar approach is presented by Nichols [3]. In both cases standard-compliant URCs and devices can exchange information, and thus users can have a single URC (a cell phone, for example) to control multiple devices, such as TVs, STBs, ATMs, etc. Users with special needs can have customized URCs to improve accessibility.

On a complimentary approach, Siegemund [5] proposes that handheld devices can be used as the primary UI for smart environments. He also notes that cell phones can be used for short range (Bluetooth, Wi-fi), as well as long-distance (web, GSM) data networks, enabling interaction in the same environment or not.

Focusing on the convergence of home appliances, Spinellis [6] points out that multiple devices have a "gratuitous duplication of functionalities, and a lack of standardization," ... "exemplified by the growing array of remote controls adorning the typical lounge table." He also proposes that the UI is the most important problem in home appliances since they have very limited interaction devices and lack the basic principles of interface design and user centered design.

Fortunati [1] proposes that in practical terms, the cell phone ends up being more of a personal than mobile technology since it's perceived as related to the person, and not the fact that the person moves in space.

The Experiment

With the emergence of computer-mediated entertainment (CME) there is an increasing amount of content available for the computer, which is still not available even on DTV. Video podcasts, movie trailers and Archive.org's Movie Archive [2] are some, to name a few. Also the standard PC is capable of simple DVD playback, merging PC and TV functionality.

Due to these facts the computer is migrating into the living-room in the form of an HTPC, which is usually connected to a TV display (instead of a monitor) and is controlled wirelessly (mostly through an RC, but also via keyboard). The HTPC is also geared towards entertainment activities, which requires an easier and more specific Graphical User Interface (GUI) than the standard Desktop PC.

Aware of this trend, both Microsoft and Apple have released HTPC versions of their software. The first has a specific OS, Windows Media Edition, while the latter

has an application called Front Row. For its availability and easier integration, the second was chosen for this experiment.

Front Row GUI and Remote Control

The Front Row application is a playback-only wrapper for several media-related applications on the Macintosh. It integrates iTunes (music, podcasts and video), iPhoto (pictures) and DVD Player (DVDs) into one simple GUI.

The input device is an infrared (IR) RC with 6 buttons, very similar to the iPod Shuffle. This RC and the Front Row application are only available for recently released machines. For this experiment we used an iMac G5 as the original interface.

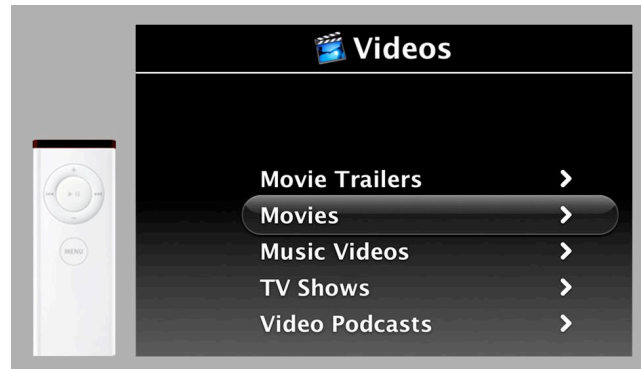


figure 1. Remote Control and Front Row Menu Interface

Once Front Row is started, the traditional Desktop environment fades in the background and 4 big icons are presented to the user. From this point on all the navigation can be done through the RC and on-screen menus. The menu navigation structure and interaction

style are the same as the one present in the iPods, up/down arrows highlight items on a menu, ok selects the highlighted item and "menu" goes back one level.

Experiment Setup

The original setup for the Front Row application is designed for a specific input (the custom RC) and output (the built-in 17- or 20-inch LCD) devices.

In our experiment we replaced the input device with a Bluetooth-enabled cell phone (Sony Ericsson T68i) and the output device with a Standard Definition (SD) 29-inch TV.



figure 2. Experiment input and output devices

These substitutions were easily done, since the iMac has Bluetooth connectivity and an S-Video (through an adapter) and stereo outputs. Additional software was needed to receive the input and control Front Row. This was achieved through a script in conjunction with Romeo [4], a freeware application for the Macintosh.

Having both interfaces functional we selected several activities and performed them in both setups to verify the level of degradation on the experimental interface.

The selected activities are the ones commonly used for selection and playback of the media items on Front Row. These activities were all performed for the three kinds of media available (music, video and slideshow):

- volume control
- navigate to and select media item
- play
- pause
- fast forward
- rewind
- go to next item while playing (music only)
- go to previous item while playing (music only)

Since the focus of the experiment was the comparison of the two UIs in terms of consistency and synergies we decided for an inspection instead of formal usability testing. Also, we did not consider problems on the UI that were inherent of the Front Row application (e.g.: latency and lack of feedback) and didn't relate to the difference between the original and experimental UIs.

Results

In general terms the consistency between the UIs was satisfactory, considering that this was not planned in advance. Out of the 20 activities, 4 were not possible (fast forward and rewind for music and video) and navigation through long lists had some degradation.

In terms of output, the Front Row GUI is very well suited for a TV CRT screen and to be used from an average distance of 3 to 4 meters. It is designed for various screen sizes and respects title-safe margins, so none of the elements were cropped from the screen. There were no artifacts or distortions such as interlace flicker or "bloom" of borders and the font size was large enough. Sound effects for navigational items also made the UI more "playful" and less serious.

The input device was responsible for the 4 problems found, specifically because its buttons didn't support the "press and hold" functionality.

On the original interface pressing and holding the buttons for left and right would rewind and fast forward the music or video, and thus this was not possible on the experimental interface.

Press and hold was also used on the original UI to speed up while scrolling up or down on long lists of items on the menus. Speeding up was not possible on the experimental UI, so scrolling through long lists had to be done item by item, which is a lot slower and cumbersome. Nevertheless, it could be done.

Besides this all the other activities were equally easy to accomplish on both setups. Actually, the experimental interface had one advantage over the original, the RC did not have to be pointed to the receiver. This was a side effect of using Bluetooth, since radiofrequency is omni directional (different from IR), and presents a few advantages such as position of operation.

Discussion

Considering that the experimental setup combined three pieces of equipment that were not purposely designed to work together, they presented a relatively high level of consistency and synergy.

The main reason for this is because both the Front Row application and the cell phone had a similar navigational scheme: 4 directional arrows, a selection and a "cancel" button.

If the cell phone had only 2 directional arrows or the Front Row GUI relied on screen button for cancel, the level of degradation would be a lot worse and even the lack of one single functionality (press and hold) had a significant impact on the UI.

While the Front Row RC could have more buttons for specific tasks, and the cell phone does have many other buttons, the fact that both systems shared a simple and consistent interface allowed a good level of UI convergence between these two devices.

Considering that this same result does not happen very often in consumer electronics [6], it is interesting to question what are the elements that would create a complete convergence between different devices.

In which levels should this convergence be expressed? Functionality and information architecture is one level. Input and output devices is another. Is screen layout yet another level? Are there general rules that could be applied universally for consumer electronics? The directional arrows, select and cancel buttons is one candidate, as well as menus and submenus structures. Are there other candidates?

Finding answers for these questions is a good start for the development of an UI continuum.

References

- [1] Fortunati, L. The Mobile Phone: An Identity on the Move. *Personal Ubiquitous Comput.* 5, 2 (Jan. 2001), 85-98.
- [2] Movie Archive. <http://www.archive.org/details/movies>
- [3] Nichols, J., Myers, B. A., Higgins, M., Hughes, J., Harris, T. K., Rosenfeld, R., and Litwack, K. Personal universal controllers: controlling complex appliances with GUIs and speech. In *Ext. Abstracts CHI '03*, ACM Press (2003), 624-625.
- [4] Romeo 0.9.3. <http://www.irowan.com/romeo/>
- [5] Siegemund, F., Floerkemeier, C., and Vogt, H. The value of handhelds in smart environments. *Personal Ubiquitous Comput.* 9, 2 (Mar. 2005), 69-80.
- [6] Spinellis, D. The information furnace: consolidated home control. *Personal Ubiquitous Comput.* 7, 1 (May. 2003), 53-69.
- [7] Zimmermann, G., Vanderheiden, G., Ma, M., Gandy, M., Trewin, S., Laskowski, S., and Walker, M. Universal remote console standard: toward natural user interaction in ambient intelligence. In *Ext. Abstracts CHI '04*, ACM Press (2004), 1608-1609.

About the Authors

Gil Barros is as an interface designer and is currently developing his Master's project on user interfaces for interactive television at the Laboratory of Integrated Systems, University of São Paulo (LSI-USP).

Julia Benini is as a user interface designer and is currently developing her Master's project on user interfaces at the Laboratory of Integrated Systems, University of São Paulo (LSI-USP).

Marcelo K. Zuffo is an associate Professor of Interactive Media at the Laboratory of Integrated Systems, University of São Paulo (LSI-USP).