

Balancing Simplicity and Functionality in Designing User-Interface for an Interactive TV

Hyowon Lee¹, Cathal Gurrin¹, Paul Ferguson¹, Sorin Sav¹,
Thomas Foures¹, Stephane Lacote¹, Noel E. O'Connor¹, Alan F. Smeaton¹ and Heeseon Park²
¹Centre for Digital Video Processing, Adaptive Information Cluster, Dublin City University, Ireland
²Software Laboratories, Samsung Electronics, Suwon, Republic of Korea
hlee@computing.dcu.ie

Abstract

Recent computer vision and content-based multimedia techniques such as scene segmentation, face detection, searching through video clips, and video summarisation are potentially useful tools in enhancing the usefulness of an interactive TV (iTV). However, the technical nature and the relative immaturity of these tools means it is difficult to represent new functionalities afforded by these techniques in an easy-to-use manner on a TV interface where simplicity is critical and the viewers are not necessarily proficient in using advanced or highly-sophisticated interaction using a remote control. By introducing multiple layers of interaction sophistication and the unobtrusive semi-transparent panels that can be immediately invoked without menu hierarchy or complex sequence of actions, we developed an iTV application featuring powerful content retrieval techniques yet providing a streamlined and simple interface that gracefully leverages these techniques. Initial version of the interface is ready for demonstration.

1. Simplicity for Interactive TV Interaction

It is common to draw from an existing body of knowledge, skills and experiences within a dominant medium when we try to design for a relatively unexplored medium. However, in most cases the attempt to simply transfer accumulated knowledge and skills embodied in “design guidelines” across different media fails because each medium carries with it a different set of characteristics and the context of use that need to be appropriately exploited. An obvious example is the interaction design for mobile devices such as PDA, where past attempts to port the rich and attention-requiring Graphical User Interface (GUI) paradigm did not work due to the small screen, awkward input methods and the common usage contexts where the user is not able to give constant visual attention to the device (e.g. while waiting for a bus or walking). A similar situation applies to the design of tabletop interface where the consideration on task division among co-located users around the table, the degree of workspace awareness amongst them, and their action rights on the table territory should form the major design factors in shaping the

table interaction. Merely adopting the same design paradigm and strategies from the rich and well-investigated desktop GUI and Web design to a different platform mostly results in inadequate design, causing wasted time, effort and ultimately, user frustration. Designing for iTV is no exception. The special characteristics that distinguish it from other media include lean-back (as opposed to lean-forward) user attitude and position, remote control as the input device, and the focus on enjoyment (as opposed to efficiency), implying a new set of interaction paradigms, guidelines and strategies to follow, such as following guidelines:

- Indicate how to start/exit an interactive feature;
- Use large text size (e.g. minimum 18pt as suggested in some recent literature);
- Avoid too much detail, avoid text input;
- Use a shallow or flat menu hierarchy;
- Use satisfaction-oriented measures for evaluation (Chorianopoulos & Spinellis, 2006).

Currently there is no firmly established knowledge base and only a handful of design guidelines for iTV interfaces, most of which still need further empirical validation. However, the major consensus from the small number of studies is a focus on *simplicity* (Ahonen et al., 2008); the lean-back TV viewer sitting on a couch 2-3.5m away from the TV to watch something for the next hour in the evening with family will seldom expect to be carefully manoeuvring a sophisticated array of widgets and high-fidelity visualisations on the TV as if using a desktop office application at work.

2. Interactive TV with Multimedia Techniques

The Interactive TVe project in our research centre, supported by Samsung Electronics, is developing a next generation consumer TV application that features newly-emerging computer vision and multimedia techniques to support a number of novel functionalities for viewers. The techniques centre around *automatic* provision of video content indexing and retrieval, including:

- Camera shot/scene boundary detection;
- Keyframe extraction;

- Video summarisation (e.g. sports highlights);
- Face detection and identification;
- News story segmentation in TV news video;
- Searching the video archive;
- Enriching program metadata by crawling Web.

The above techniques form some of the current agenda items in many research laboratories in the field of computer vision and multimedia retrieval, and are still to be applied to real world applications.

In researching how the above techniques, when sufficiently mature, could be integrated into a consumer TV set in order to provide a new set of advanced, useful and entertaining features for iTV viewers, our main challenge is the issue of balancing the need for simplicity with increased novel functionality. Representing the novel functionalities afforded by the techniques listed above could easily complicate the interaction sequences, over-populate the TV screen with an array of icons, highlights and imagery which from the design point of view we want to avoid. For example, searching the video archive conventionally requires a text box where the user types in query terms – typing in text using a remote control can be a cumbersome task whether using an on-screen keyboard or SMS-style pressing on the remote; the result of automatic face identification is conventionally represented as a thin rectangular box around a person’s face with the name of the person beside it, while appropriate on a personal photo management software on a PC, this is undesirable on a TV screen as it disrupts the watching and forces the viewer to respond to it.

We designed a feature-rich TV with emphasis on making these new functionalities as transparent and simple as possible for TV viewers. For example:

Semi-transparent interactive elements - to minimise the viewing disruption to other co-viewers when one is holding the remote and interacting with the TV, we use semi-transparent panels sliding in and out on top of the TV screen allowing co-viewers to be minimally disrupted while also providing natural and easy re-focus of attention to the overlaid interactive elements (Harrison et al., 1995).

Multiple levels of interface sophistication - by allowing the change between the level of sophistication of a feature by repeatedly pressing a colour button on the remote, a straightforward “layered” or “spiral” approach can be achieved. For example, pressing a “Browse” button will slide in a semi-transparent scene-level browsing panel at the bottom of the screen, pressing the button again will expand it to show shot-level browsing on top of the scene-level, turning into a powerful hierarchical navigation; pressing a “Find Similar” button will

slide in a panel where other shows similar to the currently watched show are suggested. Pressing the button again will list segments from other shows that have high visual similarity to the segment currently being watched. By using what the viewer is currently watching as a query of different types selected by repeated button presses, we gracefully eliminate the need for the text query box. Figure 1 shows a screenshot where a viewer pressed the “Find Similar” button to see other shows and YouTube clips similar to the currently watched show.

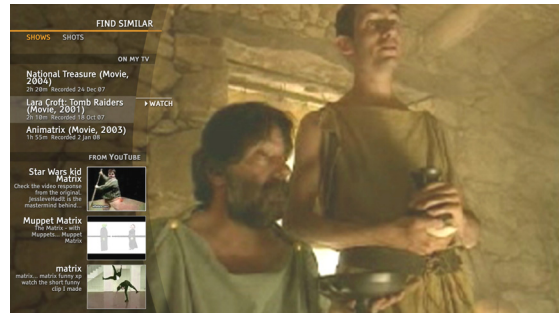


Figure 1. Finding shows similar to currently watched

In this way, we have arranged the myriads of potentially sophisticated features derived from novel content-based techniques in a flat menu hierarchy, immediately accessible with the press of a small number of buttons in the increasing degrees of sophistication, resulting in a surprisingly simplistic and streamlined iTV interface yet featuring many powerful video techniques. The initial version of the system will be demonstrated.

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