From the Flashing 12:00 to a Usable Machine:
Applying UbiComp to the VCR

Jeremy R. Cooperstock
Sony Computer Science Laboratory
Takanawa Muse Building 3F, 3-14-13 Higashi-Gotanda,
Shinagawa-ku, Tokyo, 141, Japan
+81-3-5448-4380
jer@csl.sony.co.jp

ABSTRACT

The hype of intelligent appliances and "smart homes" has so far failed to produce consumer electronics technology of mass appeal. It is our contention that common frustration with overly complex user interfaces has been the foremost obstacle preventing society from reaping the benefits promised by such technology. In order to replace the remote controls and command consoles that litter both our work and home environments, we suggest that existing technologies can be combined to enable more appropriate human-computer interaction, and thus, produce truly usable machines.

Keywords

Ubiquitous Computing, VCR, interface design

INTRODUCTION

At home I used to have a very intelligent VCR with near perfect voice recognition and knowledge of me. I could ask it to record programs by name and, in some cases, even assume it would do so automatically, without my asking. Then, all of a sudden, my son went to college. (Negroponte [4]).

Negroponte's joke reflects a sad truth not only concerning VCR interfaces but about modern technology as a whole. In our day-to-day activities, we are confronted by numerous examples of feature-rich devices that are either too complex or confusing for most of us to operate successfully [5].

Ubiquitous Computing (UbiComp) [8] proposes to overcome our frustration with this situation by endowing everyday devices with computational abilities and allowing the user to interact with them without the mediation of a traditional computer interface. This approach has been successfully demonstrated in a computer-augmented videoconference environment known as the Reactive Room [2]. However, before we commit ourselves to developing an extensive infrastructure of such computer-augmented devices for general use, it may be worthwhile to investigate the improvements possible to a single appliance through UbiComp. After all, a fully integrated "smart house" is of little use if the owner cannot even access the functionality of a single device in isolation. We therefore turn our attention to one of the most notorious examples of poorly designed appliances, namely, the VCR.

WHAT'S WRONG WITH THE VCR?

The VCR provides an excellent example of modern technology that has recently found its way into a majority of American homes [6]. Unfortunately, like so many other feature-rich appliances today, the full potential of these machines is rarely exploited. How many VCRs in the country are presently flashing "12:00" because the owner lacks the patience or expertise to set the clock? Marcus cites a survey of R.H. Bruskin & Associates, indicating that one-third of American VCR owners have given up programming these devices because they cannot understand the instructions and controls [3].

Put simply, there are generally too many buttons either on the device itself or on the associated remote control, making it exceedingly difficult for the bewildered user to figure out how to perform anything but the most basic task. Adjusting the clock or setting the VCR to record a program at some future time often requires over a dozen button presses, or, in the case of VCRplus systems, manual consultation of the TV guide in order to determine the appropriate program code.

THE UBICOMP VCR

Our UbiComp-inspired solution to such problems involves a combination of alternative interfaces and automatic interaction with an on-line database of program schedules and user-specific information. The intention is to reduce a reliance on the multi-button remote control while permitting technically unskilled users to access the full functionality of the VCR. Before elaborating on this approach, we review the design goals that we believe are imperative for its success:

- provide the user with high-level interaction capabilities so that tasks such as program recording can be specified easily
- hide controls that are irrelevant to the current task
- allow full manual override of any function at any time, for example, timer-record programming by the traditional specification of channel, date, start and end times [7]
- ensure that timely, meaningful feedback is provided to the user concerning the execution of each command

Alternative Interfaces

Conventional remote controls only permit low-level interaction, for example, requiring that a program to be recorded is specified by entering the channel, date, start and end times. Instead, we have incorporated a speech recognition system with a program schedule database so that users can specify programs to record by name. When the speech recognition system fails to uniquely identify a matching program, the most promising candidates are displayed on-screen, and the user can select the appropriate one by index number. Schedule details are then provided automatically by the database and the VCR essentially programs itself. Following our design goals, this program information is displayed for user verification, and can be manually edited if any changes are desired [1].

Voice-activated commands are not always ideal or even appropriate, such as for simple play/stop/rewind controls or for timer-program editing as just described. The use of on-screen displays provides the motivation for a pointing or selecting tool to access such functions. Candidate technologies include a wireless mouse and a laser pointer with calibrated detector.

Prototype Implementation

In our prototype implementation, pictured in Figure 1, a video camera with a low-red bandpass filter is used to detect the position of a laser beam on the television monitor. When a user points a laser pen at the screen, the system responds by generating a video overlay menu on the monitor. Basic tape transport and channel selection controls can then be invoked by selecting the corresponding icon. The behaviour is similar to a conventional remote control, except that users do not need to look away from the screen in order to find the appropriate button. Furthermore, different menu screens can be generated that are relevant to the current task, for example, frame advance/rewind commands can be highlighted when the pause mode is invoked, and similarly, dubbing commands can be highlighted in record mode.

Figure 1   Video overlay menu of generic VCR tape transport icons produced in response to the detection of a laser beam on the television monitor.

Exploiting context and on-line information

VCRs are typically insensitive to additional context such as the scheduling information of the current program being viewed on the television. By exploiting this readily available information, our augmented VCR can respond intelligently to utterances such as "record this show next week" or "when will this program next be aired?"

CONCLUSIONS

As other similarly augmented devices become available, we can realize coordinated behaviour through their interaction with each other. For instance, the television could automatically lower its volume when the telephone is in use.

In the near future, we might expect our VCRs to learn our viewing habits through experience and automatically record certain programs without being told. The scenario described by Negroponte [4] need not be limited to human-human communication. We believe that the UbiComp approach, applied thoughtfully to a broad spectrum of appliances, has a tremendous potential to improve the quality of human-computer interaction, and hence, increase the benefits of technology to its users.

ACKNOWLEDGEMENTS

REFERENCES

1.   Cooperstock, J.R., Fels, S.S, Buxton, W. and Smith, K.C. Reactive Environments: Throwing Away Your Keyboard and Mouse. To appear in *Communications of the ACM.*

2.   Cooperstock, J., Tanikoshi, K., Beirne, G., Narine, T., and Buxton, W. Evolution of a Reactive Environment. In *Proceedings of Human Factors in Computing Systems CHI '95*, (May 7-11, Denver, CO). ACM Press, New York, 1995, pp. 170-177.

3.   Marcus, A. The Future of Advanced User Interfaces in Product Design. In *Proceedings of Tenth TRON Project International Symposium,* (Tokyo, Japan). IEEE Computer Society, 1992, pp. 14-21.

4.   Negroponte, N. *Being Digital.* Knopf, New York, 1996.

5.   Norman, D.A. *The Psychology of Everyday Things.* Basic Books, New York, 1988.

6.   Venkatesh, A. Computers and Other Interactive Technologies for the Home. *Communications of the ACM,* 39,12, (December 1996), 47-54.

7.   Vicente, K. and Rasmussen J. The Ecology of Human-Machine Systems II: Mediating "Direct Perception" in Complex Work Domains. *Ecological Psychology,* 2,3, (1990), 207-249.

8.   Weiser, M. Some Computer Science Issues in Ubiquitous Computing. *Communications of the ACM,* 36,7, (July 1993), 75-83.