

Human Interfaces Supporting New Encounters with Digital Content

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OVERVIEW: Today, vast quantities of media content of all kinds are circulating around us. Typically this content is scattered in different places, sometimes in multiple copies, and often cannot be found even when it is stored on your hard disk drive. So, clearly, digital content is not be used to its best advantage. To address this situation, the HHIL (Hitachi Human Interaction Laboratory) has conceived and developed an array of novel interfaces that increase the chances of finding the information one is seeking. More specifically, HHIL is trying to eliminate constraints of time, place, and limits imposed by different media and formats through a broad range of developments, including a new TV browsing interface that identifies the scenes one wants to see, various GUIs that increase the chances of encountering content of interest, and a very user-friendly mobile media player that lets you enjoy the media content that you have. HHIL is committed to design and development that improves the quality of the user experience derived from original content, and also improves the sheer pleasure and satisfaction people have in interacting with the content that they encounter.

INTRODUCTION

RECENT advances in IT (information technology) and extensive penetration of networks have made the handling of enormous amounts of digital content commonplace, even at the ordinary consumer level. People have more and more options for obtaining media content from TV, the Internet, and from their

digital cameras. So, with increasing capacity and lower costs of storage, many people today are inundated with all kinds of media content.

In addition, we are seeing profound changes in TV viewing style made possible by the digitization of TV programs, proliferation of channels, availability of terabyte-capacity HDDs (hard disk drives), and

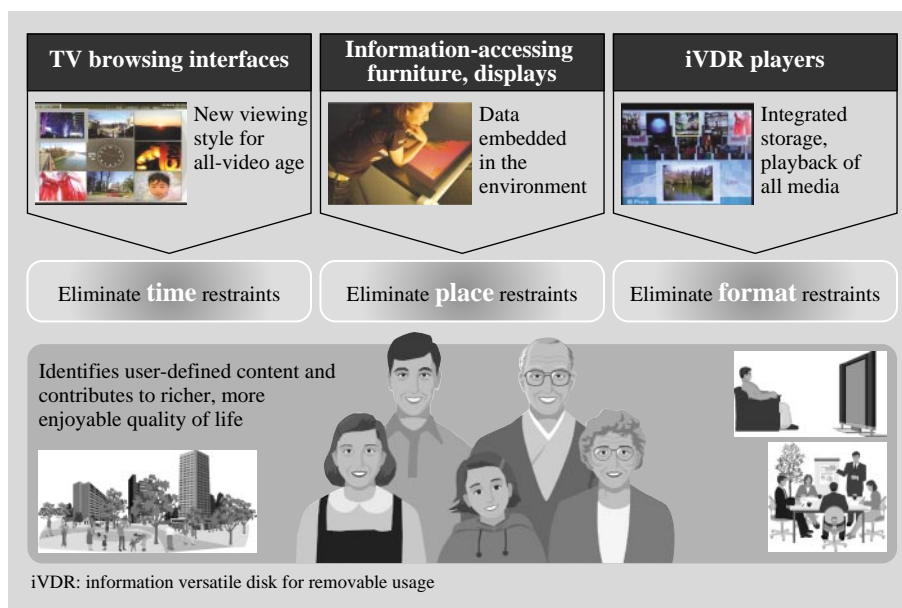


Fig. 1—Appliances and Interfaces Locating and Using Data Content. HHIL is committed to designing and developing new TV browsing interfaces, displays such as “information-accessing furniture,” iVDR-based mobile displays, and other devices for locating user-defined content and contributing a richer, more enjoyable quality of life.

products with multiple tuners. There is also a growing tendency for people to use time shifting to record programs of interest using an EPG (electronic program guide) and watching programs later at their own convenience. Yet the manipulation of viewable media content is becoming more complicated as digital appliances in the home such as HDD recorders, TVs, and PCs become able to interact thanks to standardization, and as the sheer volume and range of types of digital content continue to grow.

These developments do not just apply to watching television. The growing popularity of media such as iVDR (information versatile disk for removable usage) featured in this special issue enables people to take video, music, and other kinds of content along with them to enjoy whenever and wherever they go without violating the copyrights of the artists and content owners. Supporting this development will require a new generation of interfaces that provide unified management and seamless handling of all the different types of content at home, at the office, on the road, and everywhere else.

HHIL (Hitachi Human Interaction Laboratory) is keenly aware of these developments and new emerging

patterns, and is actively investigating a number of devices and user interfaces that will give users new opportunities to access and enjoy a full range of digital content^{(1), (2)} (see Fig. 1). Here we will highlight some of these initiatives and comment of the direction of research in the years ahead.

DIGITAL CONTENT AND EMERGING USE TRENDS

Fig. 2 shows various kinds of digital content that we encounter and consume every day. Unfortunately, this data is usually scattered in different places, sometimes in multiple copies, and often cannot be found again even though the data is stored on one's HDD. So, currently people are not fully enjoying the benefits of digital content.

Let us consider some typical examples:

(1) Data is provisionally copied from a shared server to the desktop for editing, but then one forgets where the original data was stored. So, now multiple versions of the data exist but no one knows which version is the most recent.

(2) Downloaded music is copied to a portable audio player, but inadvertently a flood of additional copies

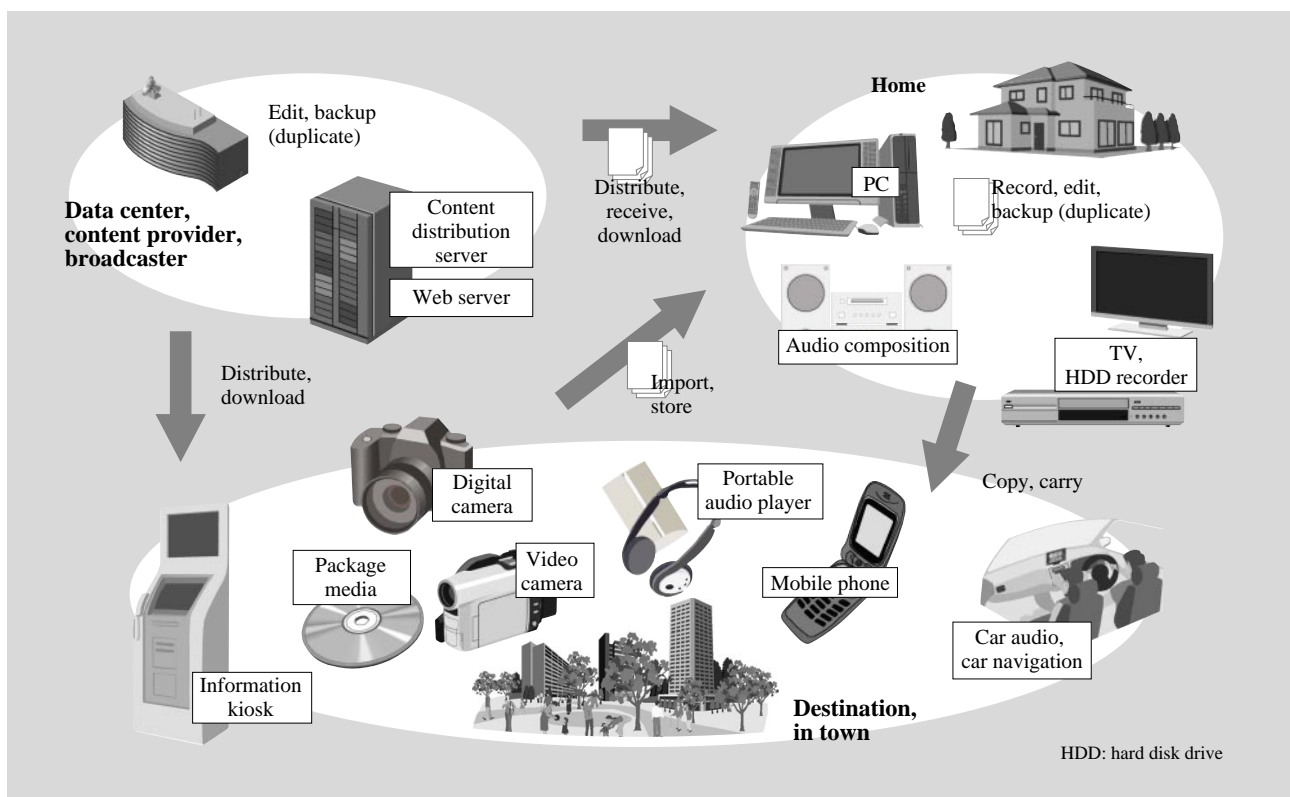


Fig. 2—Digital Content is Scattered.

In processes of repeatedly manipulating digital content—importing, exporting, editing, moving, and copying—content often becomes dispersed, and one loses track of which is the original data and which is the latest version of the data. Illegally copied data might spread.

are made because the computer was synchronized with a number of other PCs, and no one can recall the location of the original music.

(3) Or it is also very common for people to save recorded programs intending to watch them later or store pictures taken with a digital camera on an HDD, but then not be able to find the programs or photos later.

Much the same as this disorganized dispersal of content at the individual level, a similar scattering of content at the global level is already turning into an enormous problem. And abusing the ability to freely copy and edit digital content, which is both the chief benefit and drawback of digital media, there is a great excess of pirated and illegal copies of digital music and movies and other kinds of content. The overabundance of unattributed and poorly attributed data increases the risk of getting fraudulent or misleading information, and circulating fabricated and pirated content unintentionally violates the rights of the legitimate content owners.

APPLIANCES AND INTERFACES FOR ACCESSING AND CONSUMING MEDIA CONTENT

Interfaces for Seeking Scenes You Want to See

To address changing patterns in TV viewing style, HHIL researchers collaborated in concentrated brain storming to come up with new kinds of TV browsing interfaces that are both simple yet enjoyable to use. Based on ideas that emerged from these sessions, we developed prototypes for two types of GUIs (graphical user interfaces) illustrated in Fig. 3⁽³⁾. The interfaces adopt different approaches to the organization of content virtual space; one organizes content along a time axis while the other organizes content across multiple channels. Both are navigated using a remote control on a TV screen.

The “Multi-stream GUI” targets defined types of images across multiple channels at a particular point in time, and searches for channels that the viewer might be interested in watching. Built around an analog clock, the interface is capable of displaying up to eight different kinds of images at the same time. By setting the time on the analog clock with the remote, the interface finds images recorded in the past, EPG information for images that will be broadcast in the future, etc. Functions are built into the interface for changing the search date or time, and for specifying the image search category.

By contrast, the “Time-oriented GUI” targets

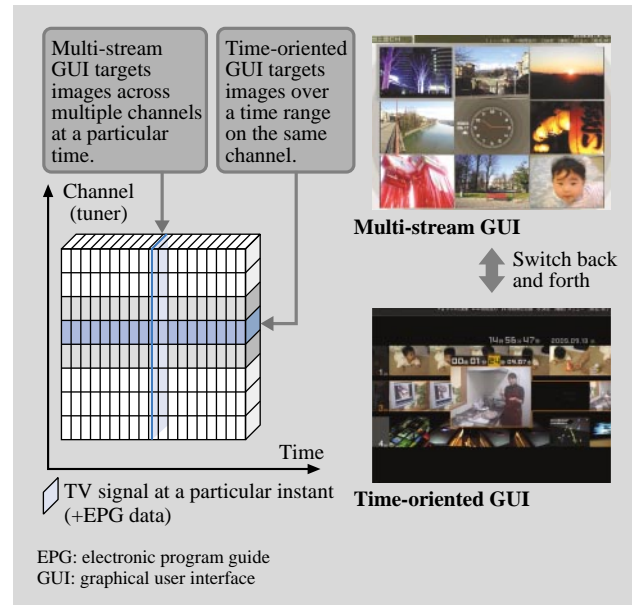


Fig. 3—Multi-stream GUI and Time-oriented GUI.

When all images on multiple channels or tuners are recorded in a time series, there are two approaches for searching for scenes that viewer wants to see, and one can switch back and forth between the two methods to display the results.

images over a time range on the same channel, and searches for scenes the viewer might be interested in watching in that range. The interface displays images for a time range for three channels at the same time, and groups the still images for each time interval. The time interval can be set and changed using the remote, and scenes of particular interest can be flagged for later identification and viewing.

Essentially, these interfaces make it possible to scrutinize a vast amount of TV program data within a short period of time regardless of the actual broadcast time, and quickly identify scenes of special interest that the user wants to see. In short, these interfaces permit users to locate the specific content they are seeking freed from the constraint of time.

Displays that Increase Opportunities to Access and Consume Content

Certainly the amount of content an individual can consume is only a minute fraction of the amount of content one could receive. This led us to undertake a number of initiatives that would increase opportunities for people to consume more of the data content that is available around us. This cannot be accomplished by simply deploying a lot more PCs and displays. Rather, we realized the importance from the very start of being

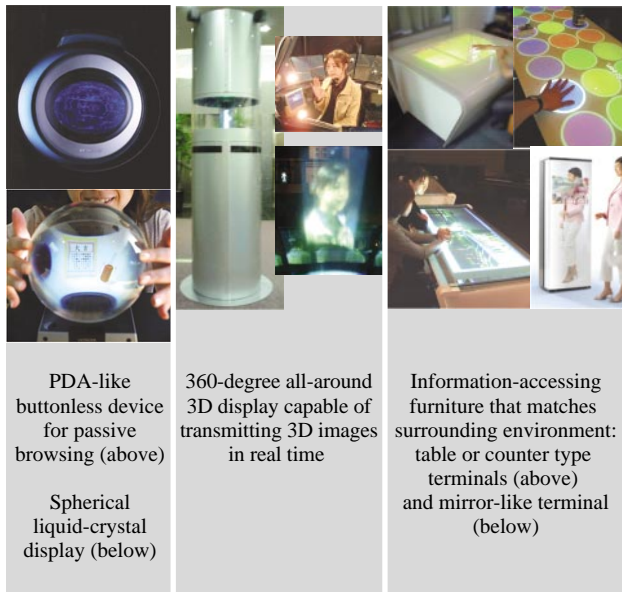


Fig. 4—Novel Prototype Displays.

HHIL developed a number of novel displays to increase opportunities for people to access and consume digital content. The objective of all these projects is to increase opportunities for encountering data content in ways that are simple, intuitive, and enjoyable.

able to display content in a way that naturally integrates with people's lives, that is simple and intuitive to manipulate, and that matches the scene or situation at the time.

This led us to the concept of "information-accessing furniture," information devices that can be used just like the tools and items of furniture which match the surrounding environment without detracting from the quality of the space. We have developed innovative information displays illustrated in Fig. 4 that enable people to access and interact with content in a natural intuitive way.

Developed are two novel devices that support passive browsing and exposure to a lot of content area PDA (personal digital assistant)-like device with no buttons at all⁽⁴⁾, and buttonless device featuring a spherical liquid-crystal display. And Hitachi's 360-degree all-around 3D (three-dimensional) display⁽⁵⁾ supports realtime display and transmission of 3D images and greatly expands the range of content that users can manipulate. The type of information-accessing furniture⁽⁶⁾ includes a table-type terminal that uses shadow as the user interface (there are table, counter, and wooden table versions of the system), and mirror-like terminal that directly displays digital information on a mirror surface using an LCD (liquid

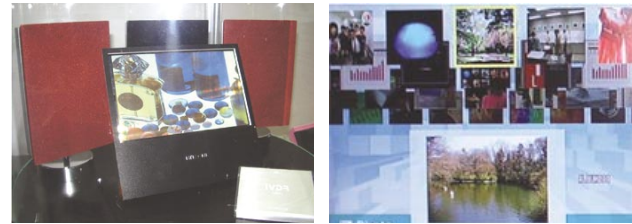


Fig. 5—Prototype iVDR Player (left) and Screen Shots (right). The prototype incorporates iVDR with built-in copyright protection and software for playing content, and allows user to enjoy a full range of digital content by plugging the device into portable TV or display.

crystal display) projector.

The objective of all these innovative developments is to increase the opportunities for people to access and consume more data content in ways that are simple, intuitive, and enjoyable. In short, these displays allow users to encounter digital content in ways that are freed from the constraints of place.

Appliances Permitting Free Use of Content

In parallel with initiatives to increase opportunities for users to encounter digital content, HHIL is also working closely with Hitachi ULSI Systems to develop the kind of mobile player illustrated in Fig. 5 based on iVDR that permits people to carry their media around with them so it can be enjoyed wherever they happen to be.

The iVDR player incorporates a CPU (central processing unit) with the ability to view and play images, music, video, and other kinds of file formats, and includes a terminal for outputting video signals. The terminal can be connected to a TV, a computer, a car navigation system, or other kinds of devices so people can enjoy a wide range of media content at home or anywhere.

By incorporating copyright protection technology in the iVDR, users can enjoy a full range of different kinds of digital content without being concerned about copyrights and other usage policy-related issues or about different formats. For the display, we adopt devices featuring passive interfaces that suspend different kinds of content sequentially in the same file^{(2), (7)}, so people can take and enjoy their digital content wherever they go without being concerned or even aware of the different content formats.

In addition to freedom from time and place described earlier, this kind of appliance also frees users from constraints imposed by different formats.

HUMAN INTERFACES LEADING WAY TO NEXT GENERATION

The overabundance of data inundating the world today can be attributed to data stored on HDDs and other storage devices, and data interaction linkages. The value of information is determined by our ability to access the information and the timeliness with which the information can be obtained.

While seeking to minimize constraints making it difficult for users to access large amounts of data, we believe that improving the user experience derived from the original content is also extremely important. For this reason, we plan to pursue design and development of interactions conveying individuals' thoughts and stimulating person-to-person communication by clarifying the value of digital content and distribution paths. We will expand our research objects to designing human interfaces with digital content in cyber world as well.

CONCLUSIONS

In this paper, we highlighted some of the recent initiatives of the Hitachi Human Interaction Laboratory intended to help people access and use the great abundance of digital content that is all around us more efficiently. Hitachi remains committed to developing solutions that will enable users to encounter and enjoy

digital content in new ways.

REFERENCES

- (1) Hitachi Human Interaction Laboratory Web site, <http://hhil.hitachi.co.jp/index-e.html>
- (2) T. Hoshino et al., "Challenges for New Information Environments Toward Better Encouraging Consumer Behaviors," Hitachi Hyoron **85**, pp. 723-726 (Nov. 2003) in Japanese.
- (3) J. Watanabe et al., "Two TV Interfaces for Accessing Contents at Ease in an 'Always Recording' Multi-Channel Situation," Technical Paper of the Institute of Electronics and Communication Engineers of Japan, Vol. 105, No. 570, pp. 7-12 (Jan. 2006) in Japanese.
- (4) Y. Horry et al., "A Passive-Style Buttonless Mobile Terminal," IEEE Transactions on Consumer Electronics, Vol. 49, Issue 3, pp. 530-535 (Aug. 2003).
- (5) R. Otsuka et al., "Transpost: All-Around Three-Dimensional Display System," Proceedings of the ACM Symposium on Virtual Reality Software and Technology, pp. 187-194 (Nov. 2004).
- (6) H. Sukeda et al., "Information-Accessing Furniture to Make Our Everyday Lives More Comfortable," Technical Paper of the Institute of Electronics and Communication Engineers of Japan, Vol. 105, No. 570, pp. 1-6 (Jan. 2006) in Japanese.
- (7) J. Watanabe, "Icon-Based GUI for Mobile Phones Facilitating Easy Access to Content," Transactions of the Institute of Image Information and Television Engineers, March 2005 issue, pp. 9-12 in Japanese.

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