Published in the Conference Abstracts of CHI'99, May 15-20, 1999, © 1999 ACM

mediaBlocks: Tangible Interfaces for Online Media

Brygg Ullmer and Hiroshi Ishii
MIT Media Lab
Tangible Media Group
20 Ames St., E15-445
Cambridge, MA 02139 USA
+1 617 253 4121
{ullmer, ishii}@media.mit.edu

ABSTRACT

MediaBlocks is a tangible interface for physically capturing, transporting, and retrieving online digital media, as well as for physically and digitally manipulating this media. We present a description and video demonstration of mediaBlocks' function, and consider the work as a beginning towards alleviating the abstraction and complexity endemic to traditional computational interfaces.

Keywords: tangible interfaces, phicons, interface complexity

INTRODUCTION

The mediaBlocks project developed from an interest in the user interface issues surrounding networked devices and online media. Current conventional wisdom holds that all manners of devices will be connected to the Internet, and transformed into "information appliances" which might ease our work and play. However, there are currently very few ways to bridge the interface gap between physical devices and online content, outside of the traditional computer interface of graphical widgets, URLs, and hyperlinks.

In their current form, computer interfaces are very nearly the embodiment of complexity. Most graphical interfaces require abstract symbolic manipulation of fleeting, multi-layered, general-purpose displays equally often applied to flight simulators, checkbook managers, equation solvers, and online shopping. Generally, adding a graphical interface to an appliance is roughly equivalent to taking a device that once was fairly simple, and suddenly making it rather complex.

With the mediaBlocks project, we have looked to new kinds of tangible user interfaces (TUIs) for ways to minimize the complexity and overhead of interaction with online digital media. In particular, we have developed a TUI based upon *mediaBlocks:* small wooden blocks that serve as physical icons ("phicons") [2,4] for the containment, transport, and control of online media [5]. MediaBlocks do not actually store media internally. Instead, they are embedded with digital ID tags that allow them to function as "containers" for online content, or alternately expressed, as a kind of physically embodied URL.

MediaBlocks interface with media input and output devices such as video cameras and projectors, allowing digital media to be rapidly "copied" from a media source and "pasted" into a media display. MediaBlocks are also compatible with traditional GUIs, providing seamless gateways between tangible and graphical interfaces. Finally, mediaBlocks are used as physical "controls" in tangible interfaces for tasks such as sequencing collections of media elements.

The mediaBlocks work was first introduced in [5]. This abstract presents highlights of the work, and supports this with a video demonstration.

MEDIA CONTAINMENT AND TRANSPORT

MediaBlocks' most basic function is as physical tokens facilitating the capture, containment, and transport of digital media across diverse physical world devices. This is accomplished in concert with physical *slots* mounted either directly upon or in the usage context of their associated media source, display, or access devices.

Figure 1: mediaBlock slots *for media capture and transport*

Media Capture

For instance, to capture a drawing session on a digital whiteboard, the user inserts a mediaBlock into a slot mounted upon the whiteboard's chassis. The slot responds with a musical chime, indicating that recording of the session has begun. When the block is removed, the whiteboard chimes once again, indicating that recording has stopped and the session has been transferred into online space.

Our video also demonstrates the recording of video from an overhead camera into a mediaBlock object. In this case, mounting the slot directly upon the camera is not practical. Instead, the slot is attached to a utility shelf in the area monitored by the camera.

Media Transport and Retrieval

After capturing whiteboard and video contents into mediaBlocks, the video demonstrates several examples of retrieving this content on diverse, spatially distributed devices. First, a mediaBlock may be inserted into a slot mounted upon a network printer, resulting in a snapshot printout of block contents. Secondly, mediaBlocks can be inserted into the slot of a video display kiosk, which retrieves and replays the dynamic media contents.

These examples illustrate the capture and retrieval of online media without requiring any form of graphical UI. At the same time, the GUI of traditional computer terminals provides another important platform for interacting with mediaBlock contents.

Towards this end, we show that inserting a mediaBlock into a monitor-based slot invokes a GUI view of the block's contents. These contents may then be transferred to the desktop or to GUI applications with conventional mouse-based "drag and drop" support.

MEDIA CONTROLS

While containment and transport are important mediaBlock functions, the genesis and heart of the work lies in mediaBlocks' use with physical constraint structures as *physical controls* for digital media. Here, the core of our efforts was with the *media sequencer* device, which supports the construction of multimedia sequences and presentations.

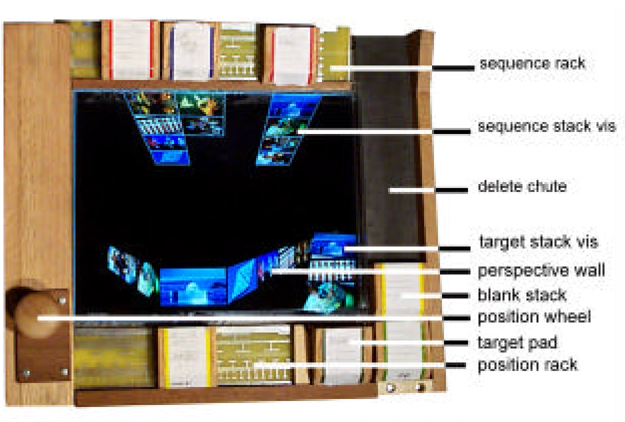

Figure 2: Media Sequencer *for construction of presentations*

The media sequencer is based on the *rack*, a linear mediaBlock constraint inspired by the Scrabble™ board game's system of letter tiles and tile racks. The media sequencer uses two racks. Each rack is adjacent to an augmenting display surface, and each is bound to different digital mappings of physical block configurations.

The upper rack is the *sequence rack*. This rack is used to sequentially *aggregate* the contents of a series of mediaBlocks into a new composite sequence. For instance, if two mediaBlocks are placed on the sequence rack – the first block containing three images, and the second a video clip – the sequence rack concatenates these into a new sequence containing the four source elements. This new sequence is bound to blocks placed upon the sequencer's *target pad*.

The sequencer's lower rack is the *position rack*. This rack is used to select or *disaggregate* media elements (images, video clips, etc.) from within a block containing multiple elements. The leftmost position of the rack corresponds to selection of the block's first element (e.g., first in a series of images). The rack's rightmost edge corresponds to the last media element, and so forth. Selected contents are again bound to blocks placed upon the sequencer's target pad.

RELATED WORK

A range of related works contributed to the development of mediaBlocks, and are discussed in detail within [5]. Two works are worth special mention. First, Bishop's seminal Marble Answering Machine interface sketch provided an early vision for the use of physical objects as digital containers, transports, and rudimentary controls. The work also powerfully illustrated the potential of physicality to lessen the complexity of interaction with digital information.

More recently, Rekimoto's Pick-and-Drop work has also demonstrated the ability to physically "pick" information from one digital device, and "drop" it onto another. This work provides a strong complement to the mediaBlocks research. Simultaneously, we believe mediaBlock's physicality gives them unique qualities missing from Pick-and-Drop's stylus-based interaction, including lessening the intrinsic abstraction and complexity of graphical interfaces.

CONCLUSION

MediaBlocks is a tangible interface for physically capturing, transporting, and retrieving online digital media, as well as for physically performing digital manipulations of this content. As such, we believe mediaBlocks suggests a path towards new approaches for physically interacting with online information, and alleviating the complexity endemic to traditional computer interfaces.

ACKNOWLEDGMENTS

Many people have contributed to the mediaBlocks work. Undergraduate students Dylan Glas, John Alex, and Paul Grayson provided key implementational assistance. Jay Lee shot the video demonstration, while John Underkoffler and Paul Yarin supported earlier videos and the project at large. John Hughes provided valuable feedback on the SIGGRAPH presentation upon which this paper is based. This work was supported in part by the TTT consortium, Mitsubishi, IBM, Intel, Steelcase, SGI, and Canon.

REFERENCES

1. Crampton Smith, G. The Hand That Rocks the Cradle. *I.D.*, May/June 1995, pp. 60-65.
2. Ishii, H., and Ullmer, B. (1997). Tangible Bits: Towards Seamless Interfaces between People, Bits, and Atoms. In *Proc. of CHI'97*, pp. 234-241.
3. Rekimoto, J. Pick-and-Drop: A Direct Manipulation Technique for Multiple Computer Environments. In *Proc. of UIST'97*, pp. 31-39.
4. Ullmer, B., and Ishii, H. (1997). The metaDESK: Models and Prototypes for Tangible User Interfaces. In *Proc. of UIST'97*, pp. 223-232.
5. Ullmer, B., Ishii, H., and Glas, D. (1998). "mediaBlocks: Physical Containers, Transports, and Controls for Online Me-