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IconStickers: Converting Computer Icons into Real Paper Icons

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1 Introduction

Many users of computers based on the desktop metaphor interface, prefer to put icons on the desktop (outside folders), or in upper-hierarchy folders . The real estate on the computer screen is therefore very quickly occupied by icons (Barreau and Nardi 1995) (Nardi and Barreau 1997).

Why not use the real world as an extension of the computer screen? This would be a natural solution, since people think of the screen as an extension of the real world. This paper describes the concept, prototype, and applications of IconStickers, which are paper icons linked to original icons in a computer.

2 IconStickers

We propose a method for taking icons off the computer screen in the form of paper icons, called IconStickers, so that they can be handled in the real world.

Figure 1: Example of an IconSticker. A bitmap image, name, and bar code are printed on a 28 x 89 mm sticker.

An IconSticker is a piece of paper on which an icon image, icon name, and machine-readable information (bar code) are printed. It is a real-world representation of a computer icon. Figure 1 shows an example of an IconSticker. It is printed by dragging-and-dropping a computer icon over an “Exit” icon, as if the user were taking it off the computer screen (Figure 3). When an IconSticker is scanned by a bar-code reader (Figure 4), the original computer icon is accessed, and is opened on the computer screen. Since IconStickers are printed on sticker labels, a user can easily arrange them in the real world, as shown in Figure 2.

3 Implementation

Figure 2 shows an overview of the IconSticker environment. A label printer and a bar-code reader are connected to a personal computer.

The IconSticker manager program is coded in C++ on Mac OS. The program has two functions. One is to generate an IconSticker image and print it when a Mac OS icon is dragged-and-dropped onto the icon of the program. The other is to “open” the original Mac OS icon on the computer screen when an IconSticker is scanned with a bar-code reader. The following sections give details of these functions.

The manager program icon is normally placed in the lower left corner of the display, as an “Exit to the real world” icon. When a user drags-and-drops an icon of a document or an application, the label printer by the display prints an IconSticker corresponding to the icon. This makes it appear as if the user were taking the icon off the computer screen (Figure 3).

Figure 2: IconStickers make it possible to arrange icons outside the computer screen.

In reality, not the icon but an “alias” of it is taken off the screen. The alias is a Mac OS icon that has a pointer to the original icon, and operations on the alias are automatically applied to the original icon (Apple Computer, Inc. 1995). Although aliases are similar to “short cuts” in Windows or “symbolic links” in the Unix file system, they have superior ability to track the original icons when their names and locations are changed.

The prototype system creates an alias for each dragged-and-dropped icon, and stores it in a predefined directory. In a network configuration, aliases are stored in a predefined file server. Each alias is identified by its name consists of 8 alphanumeric characters, indicating the time stamp when it is created.

As shown in Figure 1, an IconSticker has an icon image, an icon name, and machine-readable symbols to identify the dragged-and-dropped computer icon. The name of the alias is coded in the machine-readable symbols. In the current prototype, bar code is used for the machine-readable symbols.

The second function of the IconSticker manager program is to open or invoke the original computer icon when the corresponding IconSticker is scanned with a bar-code reader, in the same way as when a computer icon is double-clicked. When the bar-code reader detects an encoded name in an IconSticker, the program calls OS functions to open the alias icon with the same name.

Since an alias is actually created when an IconSticker is printed, the result of scanning an IconSticker is exactly the same as that of double-clicking the alias icon. An experienced user familiar with alias manipulations could easily understand the function of IconStickers.

Combining a mouse and bar-code reader has the merit of allowing users to handle computer icons and IconStickers without changing devices. It also helps to provide a mental model that enables users to regard icons and IconStickers as the same thing. In the current prototype, a pen-mouse and bar-code wand are joined together

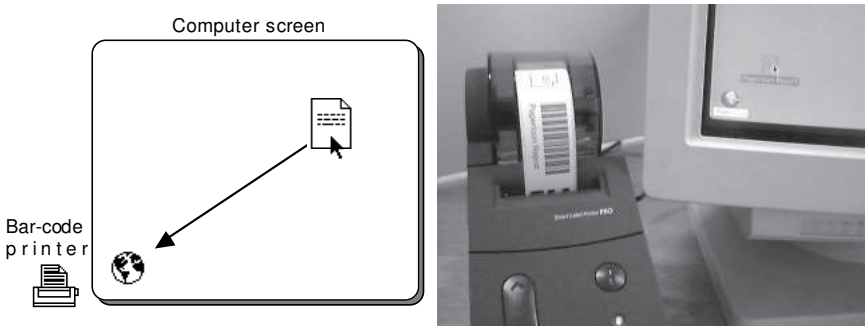

Figure 3: By dragging-and-dropping an icon onto the "Exit to real world" icon, a corresponding IconSticker is printed by a label printer next to the display.

to provide seamless operations (Figure 4).

4 Applications

IconStickers can be attached to items in a real working space, as shown in Figure 2. As a result, the variation in the layout of icons is broader than the computer display. They can be pasted into a scrapbook by people who want to manage and classify computer icons in the real world. IconStickers for frequently used applications and documents can be attached to places where users can easily access them, such as the frame of a computer display or keyboard.

Adding links to computer objects augments the capabilities of everyday items. For example, attaching an IconSticker to associates;

1, A hard copy of a document with the original soft copy.

2, A telephone with a telephone database.

3, A display or a keyboard with a control panel software.

4, A printer with a queue monitoring program.

5, A product or its manual with a URL containing the information about the product.

Figure 5, shows some examples of the above uses of IconStickers.

IconStickers allow the use of paper-based information distribution, sharing, and storing methods. IconStickers can be attached to real bulletin boards or postcards. They can even be copied by using a normal copier for paper documents. With the current prototype, it is possible to create a document-sharing system by storing aliases and original documents on a file server.

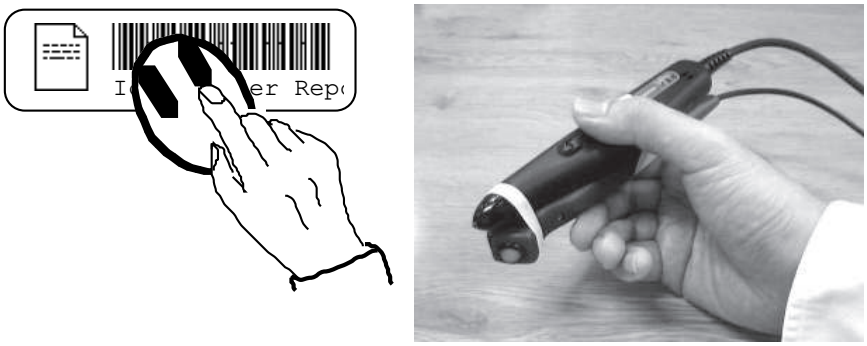

Figure 4: When the bar code part of the IconSticker is scanned with a mouse equipping with a bar-code reader, the original computer icon is opened on the display (left). A combination of a mechanical pen-mouse and a bar-code wand is used in the current prototype (right).

Figure 5: Examples of IconSticker applications. It can be used to find the original soft copy (left), or to access a telephone database (right).

5 Related work

InfoBinder (Siio 1995) is a small box-shaped device used with projector that projects a window system and its desktop into a real desktop. In this system, when the user closes a window, an icon is projected onto the InfoBinder. This experimental system is also an attempt to "materialize" icons. Conceptually, IconSticker is an extension of InfoBinder.

The MetaDesk (Ishii and Ullmer 1997) system is a system has Phicons (physical icons). Phicons represent, for examples, buildings, and can translate, rotate, and scale a map projected onto a table. Like IconSticker, it uses physically operable icons, but the shapes, objectives, and functions of these icons are different. IconStickers are tightly coupled with icons according to the desktop metaphor, and have logical links to the original iconic system.

6 References

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