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A Comparative Study on Cloud Drops

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***Abstract* - Cloud computing is a general term for everything that includes the provision of services hosted on the Internet. Cloud computing is commonly used to describe the data centers available to many users on the Internet. Drops are data distribution and replication in the cloud for optimal performance and security. Cloud Drop technology is about securing data through the cloud, as users have security concerns when they outsource their data to administrative control by third parties. Data loss can be caused by attacks by other users and nodes in the cloud. Cloud Drops is a ubiquitous awareness platform that more closely integrates virtual information from the Web into the context-rich physical spaces in which we live and work. Cloud Drops consists of many interactive stamp-sized advertisements, each showing small digital information. The large number of screens and their small size allow the user to flexibly instrument, orchestrate and reconfigure their personal information environment. We show different form factors for screens seized by stamp, deliver a concept of device and a first implementation. We suggest visualization and interaction techniques of light adapted to the tiny form factor of the device. We also provide techniques for linking these classifieds to the content the user wants to keep, including websites, contacts and locations. In order to demonstrate the performance of the platform, we present some application examples. A user study provides initial insights into how users can use cloud deletions to create a personalized information environment by delivering buffered ads across the architecture space.**

Keywords: Cloud drops, stamp size, strategy, pervasive display.

I. Introduction

People use physical space extensively to access and remember information on paper. The transformation of large parts of our old physical information environment into a digital domain has obvious advantages that should not be underestimated. However, it also costs us to give up the idea of having information in a meaningful place and to use our entire environment to manage information. Recent advances in ubiquitous display technology allow for high-resolution, yet tiny, buffer-size touch screens that include computing power and networking capabilities. These standalone devices can display tiny information, but are both tangible and extremely mobile, so they can be virtually in one place. This gives awareness systems flexibility in physical design, largely eliminating the possibility of using a portable device (e.g. a smartphone) or a static installation (e.g. a large screen or projector).

End users can flexibly organize stamp-size displays, place them in meaningful places, and easily orchestrate, orchestrate and reconfigure their personal information environment to stay attentive to digital information. However, using these tiny screens for awareness applications presents several challenges. This includes questions of how content should be displayed on screens, how it should be viewed on small screens and how the user can interact with the content. It is also unclear how multiple screens can be used in a concert and how the screens can be combined with physical artifacts to facilitate perception of the location. We are responding to these challenges and contributing to Cloud Drops, an interactive awareness platform that consists of numerous postings in stamp format that provide information on websites, contacts and locations. The end user can distribute the displays throughout the architectural space to ensure that each part is visible. The information is available in a meaningful physical location.

Figure 1: Cloud Drops help users stay aware of dynamic Web-based information and support flexible spatial layouts in architectural space

Each display represents one user-defined digital entity: a Web page, contact or place. Cloud Drops provide visualizations that can be perceived at a glance such that the user can skim changes of Web pages, contacts, and places by visually browsing through physical space.

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In addition, cloud removals offer simple interactions. Based on a holistic 6-dimensional view of the platform, we make the following contributions:

We offer different form factors for penetrating buffer size screens, deliver a device concept and an initial implementation.

We provide visualizations and interactions for websites and web applications suitable for small display sizes. We also show how Cloud Drops can support synchronous and asynchronous communication with remote people. We show concepts for attributing digital content.

We demonstrate the various possibilities offered by the platform by showing a range of activities and applications. The results of a field study provide a first glimpse of how users create personal awareness environments with Cloud Drops.

II. Small and Everywhere Displays

In contrast to static installations, tangible tokens do not suffer from high initial costs and can easily be moved around. There is a lot of work in this area. Passive tokens were used as tactile bookmarks, reminders, or to physically represent data. Pink uses passive paper and a digital pen to create written links to digital data. Other work has suggested tokens that can provide visual feedback when using a lower resolution screen (max. 8 * 8 pixels). One class of work even suggested high resolution screens. However, these only work on surfaces with a small surface (for example tables) and cannot be used throughout the architectural space. In order to overcome these limitations, solutions based on projection and wall screens have been proposed in previous works. Inspired by Mark Weiser's vision of populating rooms with interconnected displays at the customs scale, cloud drops integrate the physical flexibility of tiny tangible displays into awareness systems and support flexible physical information orchestration on the Web.

III. Design Consideration

The design of an awareness-raising platform from displays captured by stamps in the architectural space offers degrees of freedom in various dimensions. In this section, we provide an overview of the main design dimensions that form the basis of the Cloud Drops platform. The design considerations are as follows:

3.1 Shape & Size

CloudDrops can come in different shapes and sizes. The size of the ads results from a compromise between mobility and the amount of content to display. User-defined shapes for CloudDrops offer new benefits (for example, a round shape supports rotation-based interactions), but can also have symbolic meaning. For example, imagine a drop of cloud in the shape of a heart to indicate that the content of a loved one is displayed on the screen. So that CloudDrops can be attached to a variety of surfaces with different material properties, we suggest that their back be magnetic, sticky or pluggable.

3.2 Dynamic Content

CloudDrops represents dynamic digital content such as websites and documents or contacts. Each individual content is presented as a separate drop of cloud. This allows the user to flexibly attach any item to a physical location. In the other direction, a physical location is made accessible from a remote location to provide messages and communications to a particular location.

3.3 Association with Content

A cloud fall is linked to part of the dynamic digital data and shows its dynamics. Transferring this information to cloud drops is difficult because the small size of the display makes it difficult or impossible to search for traditional information. We suggest three ways CloudDrops can be linked to content:

1) The content of a device nearby with a larger screen (for example a PC, a tablet or a smartphone) is linked to a drop of cloud with a simple gesture.
2) The cloud drop recognizes the object or the surface to which it is linked and displays information dynamically positioned on this object or surface.
3) The content is defined by one or more drops of nearby clouds, which together form a group. Further details and examples are provided below for each of these associations below.

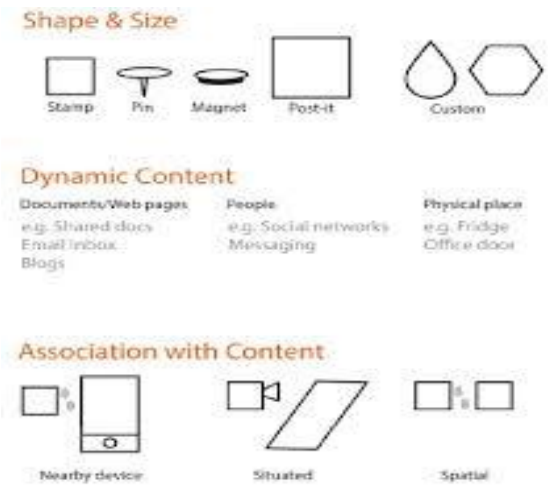

Figure 2: Cloud Drops design consideration

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We have implemented the concept of a cloud fall in two functional prototype versions (Fig. 3). Each emphasizes different aspects of the concept of falling clouds. For viewing and interacting with cloud information, a drop of cloud contains a small touch screen. The screen is large enough to display a small piece of information that can be viewed at a glance. Users can customize the look of a fall in the cloud with custom cases. As an example, we have chosen a teardrop shape and a more neutral square shape. Similar to using magnets on whiteboards or refrigerators, a drop of cloud can be attached to various objects by sticking them with its magnet and adding additional information to these objects.

Figure 3: Cloud Drop Prototypes

Our prototype B, there is a camera on the back (see Figure 3 on the back) with which the cloud and the underlying object can be easily assigned by taking a photo of the object. While a drop of cloud can be used alone as a small drop, cloud drops are often used in groups. A CloudDrops "puddle" can act as a larger, consistent unit, for example to provide more detailed information or to improve the visibility of notifications. Our prototype B detects nearby CloudDrops.

IV. Implementation

In our prototype implementation, everyone has a color touch screen with a diagonal of 1.5 inches and a resolution of 160 * 160px. It has a 600 MHz processor, an integrated accelerometer and WiFi connectivity as well as an attached RFID tag. Prototype A weighs 32 grams and measures 2.1 * 2.9 * 0.5 inches. Prototype B weighs 73 grams and measures 2.1 * 2.1 * 1.25 inches. It has an infrared sensor on each side with a maximum range of 4 cm for the detection of neighbors. As soon as a neighbor is recognized, it exchanges its identifier and the side on which it faces via an infrared protocol defined by the user. All drop clouds are connected to a central server. Other computers can detect a nearby cloud fall using an RFID reader. The battery lasts about 8 hours in normal use. Our implementation is compatible with standard web protocols and major application platforms. CloudDrops can view and interact with content from websites, Gmail, Google Docs and Skype. When linked with the Google Chrome browser and Skype, a client application runs on the nearby computer that communicates with the Cloud Drops web server.

V. Conclusion and Future work

We presented a platform for local perception and processing of information on the Web. Our results show that by dispersing clouds in architectural space, people are designing a highly personalized and localized physical / digital information environment that supports awareness of people, websites and applications, as well as interpersonal communication. Future work should examine in more detail how people use tiny screens in architectural space for long periods of time.

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