Our Experiences on the Design and Implementation of Wearable Computer: From Body-Storming to Realized Services

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Abstract. In this video paper, we describe our experiences with wearable computer to overcome the challenges in designing a wearable computer from a hardware design to realized services. We developed a bag-typed and built-in type wearable computer as Version 1.0 and Version 2.0 respectively. The new paradigm of wearable computer design is to improve the usability of the wearable platform in terms of washability and reconfigurability. As the next version, Version 3.0, we present our design and implementation of a reconfigurable wearable platform which is applicable to varied area in accordance with appearance of suites and usage goal. Then, we present its interface, called Ubiquitous space User Interface (UUI). We attempt to mitigate physical limitation of wearable platform by making full use of spatial resources and mapping mouse operations to user's gesture. In the space on the basis of UUI, a user can express one's intention easily and succeed to a general mouse device. To present the practical use of a wearable computer platform and the user-friendly interaction based on the UUI, we present a User Created Contents (UCC) service with the wearable computer.

**Keywords:** Wearable Computer Design, User Interface

1 Wearable Computer Design and Implementation

The interactive ubiquitous computing project started to investigate human interaction with smart places powered by ubiquitous computing technology, ranging from smart room and smart campus to smart city. We constructed several versions of wearable platform prototypes starting from a body-storming to realized services. We developed a bag-typed and built-in type wearable computer as Version 1.0 and Version 2.0 respectively. The new paradigm of wearable computer design is to improve the usability of the wearable platform in terms of washability and reconfigurability [1]. As the next version, Version 3.0, we present our design and implementation of a washable and reconfigurable wearable platform which is

applicable to varied area in accordance with appearance of suites and usage goal. The wearable computing platform is designed to enable attachment to general clothe thanks to clip type.

2   Ubiquitous Space User Interface (UUI)

In the advanced smart places, there are usually numerous controllable devices, each of which has different interface and different access control mechanism, making it a challenging issue to design and implement a unified interface for a smart place [2]. However, as the complexity of a user device continues to grow, so does the difficulty in accessing various operation sets and resources of the device [3]. In this section, we focuses on our effort to overcome the challenges in a limited user interface of the wearable computer by providing a new interface, called Ubiquitous space User Interface (UUI). We tried to make full use of spatial resources inside the physical space and mapping mouse operations to user's gesture as shown in Figure 1. In the space based on UUI, a user can express one's intention easily and succeed to mouse device which is the most popular input device by using one's gesture. For example, icons of GUI like as a folder, scheduler software, and e-mail software are mapped to physical objects. And all of the mouse operations are mapped to users' gestures. From the perspective of the user, the most natural way of pointing an icon of GUI is moving and pointing his/her finger at the mapped physical objects. In this way, several mouse operations like as a right click left click, and drag & drop can be mapped to user's gestures.
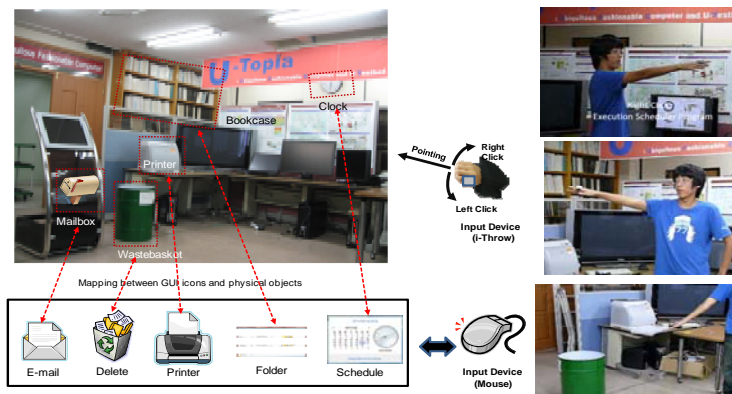

Figure 1. Mapping between Physical Objects and Virtual Icons on the basis of UUI

3   UCC with Wearable Computer

As the second realized service, we present the design and implementation of an efficient and useful application for the UCC [4] in the wearable computing platform.

User can take a picture using the camera module of the wearable computer and preview the taken the picture. In the preview state, the wearable computing platform can communicate with kiosks and blogs. We can send the captured image and various editing commands to the kiosk, including commands for the automatic uploading and registration of images on blogs. Moreover, by using gesture-based interface, the user can control the UCC system comfortably and intuitively. The user can use various intuitive hand gestures to edit the image, for example by rotating the image or adjusting its size, brightness, and contrast. Figure 2 shows the possible hand gestures and their image effects. Note that all the image effects can be applied by using the gesture interface. After the editing, the user can upload the edited picture into user's
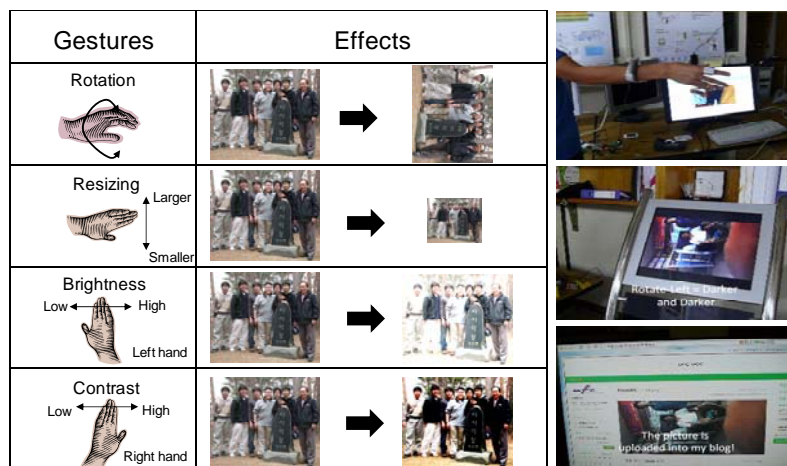
Figure 2. Gesture Interface of UCC

blog by throwing gesture to the kiosk.

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