

# Integrating object finding function into everyday fashion

Yuko MIYAKE, Naoki SAIWAKI

Nara Women's University

Kitauoyanishimachi Narashi, 630-8506 Nara, Japan

{aay.miyake, saiwaki}@cc.nara-wu.ac.jp

Yasuyuki KONO, Tatsuyuki KAWAMURA, Masatugu KIDODE

Guraduate School of Information Science,NAIST

Keihanna Science City, 630-0192 Nara, Japan

{kono, kawamura, kidode}@is.naist.jp

## ABSTRACT

In this paper, we propose a casual design for wearing an object-finding support system. The goal of this research is to integrate useful functions in everyday life into elegant fashion. This system, called "I'm Here![1]," supports the user finding a handheld object with the camera attached with body. Our previous system design employed a head-mounted camera, called "ObjectCam[2]," for continuously capturing "Life Log" and for detecting the object held by the user. This paper presents our new design where the ObjectCam is set on the waist. Its appearance naturally integrates the system functions into everyday clothing, which is crucial for ordinary people to use the function in their everyday life. Qualitative evaluation results have shown that the waist-mounted camera successfully caught the object held by the user from the posture completely different from its previous design. As a result, the degree of freedom of a design improved without losing its performance.

## Keywords

wearable, object finding, waist on camera, usability

## 1.INTRODUCTION

This paper describes a casual design for an object-finding support system. We had designed and implemented the system named "I'm Here!" This system retrieves the last recorded video of a user's viewpoint including a handheld object from the user's augmented memory. However, the systems design is not suitable for everyday life, because the viewpoint video was captured by the camera mounted on the helmet the user put on. Such setting was chosen because we had a preconception such that the direction of a camera must be aligned with the face posture. As a result, wearing of machinery tasked a neck and shoulder. Such design damages hairstyle and/or makeup for women in particular. Gemperle, et al. reported that waist/thigh is suitable for attaching devices [3]. We feel less stress for wearing something to the waist than head. For instance, waist porches are popular in these days. In addition, there is no influence to hair and makeup. Therefore, we propose the design/setting that the user wears a camera on her waist. Experimental results show that the waist-mounted camera, "ObjectCam," successfully caught the objects held by the user

even in such setting. As a result, the degree of freedom of a design improved without losing system performance. It becomes easy for ordinary people to be equipped with ObjectCam in everyday life.

## 2. SYSTEM ARCHTECTURE

The "I'm Here!" system shows a user the latest video recorded when she lastly held a target object through a head-mounted display. Viewing the video that was observed by her head-mounted camera, she can remember where and when she placed the object. Ultimately we expect that the system will act as if the object itself sends a message, such as "I'm Here!" to the user [1].

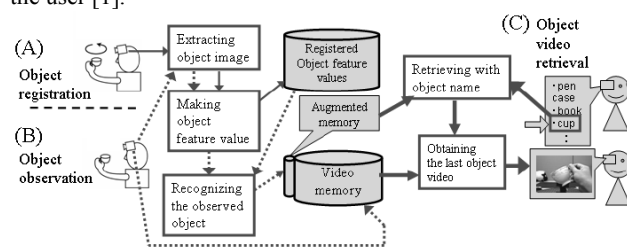


Fig1. Function of "I'm Here!"

Fig1 shows both the system function provided to the user and the process diagram of each function. In "object registration" stage (Fig1(A)), the system records a video of the object held and manipulated by the user's hand. The object is observed in several appearances from the user's viewpoint in everyday life. The system thus extracts the images of the object in several appearances from the video memory. The image groups are made from the extracted object images, based on the appearances of the objects. The system constructs the feature values from representative images of each group.

In "object observation" stage (Fig1(B)), the system abstracts the object feature values from the user's viewpoint images just as in the case of Fig1(A). Comparing the target object with registered objects, the system makes a decision based on their feature values. The system records the user's viewpoint image, and labels the image with the registered object name if the target object is recognized as one of the registered objects.

When the user wants to remember where one of registered object is, she selects the target object from thumbnails of registered objects (Fig1(C)). The system retrieves the image of

the target object from the augmented memory, and obtains the last recorded video of the target object. Lastly, the system displays the retrieved video to users through the HMD.

### 3. DESIGN CONCEPT

We propose a casual design for “I’m Here!” system in order to make the system to be common as a fashionable outfit with a wearable computer. The aim of our proposed design is to achieve a casual wearable system that a user really wants to wear in her dairy life.

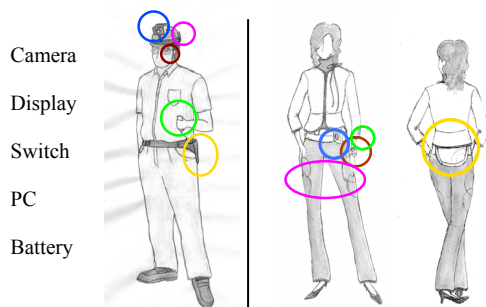


Fig2 (a) Old Version (b) Proposed Version

In our old version, a user wears a camera, a display and batteries on the head (Fig2(a)). It is the design which is hard to accept by a woman in particular. We have decided not to set any equipment on user’s head because women in general don’t prefer their hairstyle or their makeup to be messed up. Furthermore, her neck and shoulders get more and more tired if the equipment is set on her head. On the other hand, the women might show a less resistance to the waist-mounted camera because of a fashion of a waist bag. For a right-handed user, the camera is mounted on the left waist, and a camera can mainly record the right hand area. We propose not only a waist-mounted camera but also leg-on batteries, cuffs-on display and sleeve-on switch, as the component of our new wearable system for solving these problems (Fig2(b)).

For instance, the set of two-batteries are placed in front of both left and right femur and are stored in each pocket of pants. Four batteries are connected in parallel, and a user can replace one of batteries anytime. The user wears a display on her left cuffs like a wrist watch. Also, switches for operations of “I’m Here!” system are set at the left side sleeve of her jacket in order to facilitate her to control the system with looking at the cuffs-on display at the same time.

### 4. EVALUATION AND CONCLUSION

At first, subjects compared and reported the difference of both system appearances (Fig3). Almost of them liked neither a helmet and HMD nor other components appeared on him. Having distributed each component to her arm, waist, and leg considering each function, it became easy to install on hidden

area of the cloth. Most of the subjects pointed out, the appearance of the proposed design became smart and elegant. Furthermore, by distribution of placement of the components, localized load of her body has decreased. The usability has improved by wearing the control and display interfaces on the arm.

We are going to test the relationship between the recognition rate of objects and the view angle of the waist-mounted camera, although we qualitatively feel that the camera successfully captures handheld objects. We are going to quantitatively evaluate the fact that the proposed setting is better than our old design. Since distance between the hand and the camera became closer, this system can recognize an object more precisely. In this system, a right-handed person mounts the camera on left waist, so that camera can record the video in wider range that covers the movement area of her right hand (Fig3). In addition, we are easily able to recognize the background of the forgetting object from the recorded video for searching forgetting place.

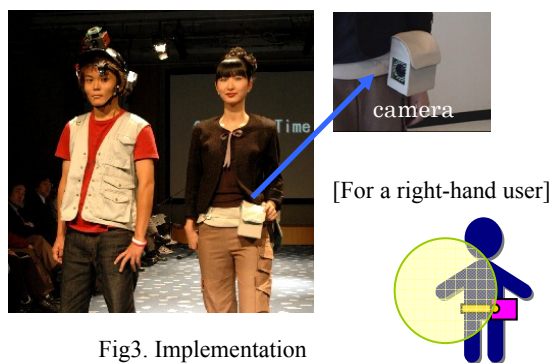


Fig3. Implementation

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