A Ubiquitous Intuitive Interaction with a Wearable Computer

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Abstract

This demonstration shows an intuitive interaction technique for a ubiquitous computing environment. The environment consists of a multimedia server and a lamp. The multimedia server supports a DVD player, a music player, and an image viewer. A user wearing our novel interface device called iThrow can transfer a file to the server with a throwing gesture. If the file is an image, the multimedia server automatically runs an image viewer and displays the received image. The user can then manipulate the size of the image using another hand gestures. He can also throw files to other users in the same way.

1. Introduction

Many researches are underway on HCIs for wearable computers. We have implemented an information transfer technique which allows users to transfer files to other devices in an intuitive manner. Existing file-transfer interfaces require the user to know the destination network address and perform an inconvenient sequence of steps (i.e. inputting the address, file name, and needed commands). Furthermore, since the number of intelligent devices will grow, and users will interact with them more frequently, we should improve the file-transfer technique more comfortable and user-friendly.

Reigl, Ringwald, and Swindells have studied on spontaneous interaction devices [2-4]. However their inventions require the users to be close to sensors or require a cumbersome solar panel.

2. iThrow, UFC and Test bed

In order to transfer a file more intuitively, we have implemented a novel interface called iThrow which can be worn on the back of user's hand. By making a throwing gesture, a user can indicate the target to which he wishes to transfer the file. iThrow is equipped with an accelerometer for hand gesture recognition and a magneto-resistive sensor for direction recognition.

The iThrow works with the Ubiquitous Fashionable Computer (UFC) [1], a human-centered fashionable computer with which we interact with the ubiquitous computing environment through intuitive interfaces, such as hand gestures. The UFC uses an ARM9 processor running embedded Linux. It also supports wireless communication (WLAN, Bluetooth, Zigbee and CDMA).

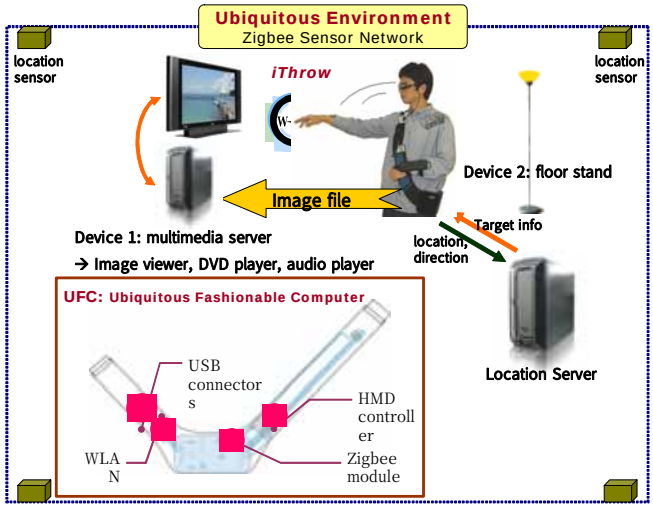

Figure 1. Intuitive interaction with the iThrow, UFC and the Ubiquitous computing environment

We have also implemented a test bed based on a Zigbee sensor network. It provides various location-based services to users wearing iThrow and UFC. The sensor network communicates with the Zigbee module in UFC to determine the user's location, and a location server periodically updates the location information. The location server tracks not only the user's location, but also the locations of devices in the test bed, such as a DVD player, light, audio system and so on. Therefore, users can control all of these devices with iThrow and UFC.

Figure 1 shows the interoperability of iThrow, UFC and the test bed. In Figure 1, a user is transferring an image file in his UFC to a multimedia server by using iThrow. If the user makes a throwing gesture toward the multimedia server, the iThrow detects it and sends the direction information to the UFC. The UFC then sends the direction information to the location server via WLAN, and the location server finds out that the object in the direction of the throwing gesture is a multimedia server using the user's current location and the direction information. The location server sends the object information (object class, IP address, port number) back to the UFC. Finally, the UFC transfers the image to the multimedia server.

We have implemented more hand gestures to allow users to control the volume of audio system, turn on a light or off, and control a DVD player. In this manner, users wearing iThrow and UFC can control various devices in the ubiquitous computing environment using intuitive hand gestures.

3. Demonstration Scenario

The main goal of setting up demonstration scenarios is to illustrate the usability of the ubiquitous fashionable computer (UFC) and iThrow.

Figure 2 shows our demonstration environment. It consists of a user wearing UFC and iThrow, Zigbee sensor nodes, a multimedia server, and a floor lamp. The multimedia server supports a DVD player, a music player, and an image viewer.

Figure 2-(a): Controlling the volume and playback of the DVD player with iThrow.

Figure 2-(b): Turning on a lamp.

Figure 2-(c): Sending a music file from his UFC to the multimedia server.

Figure 2-(d): Manipulating the size of an image sent to the multimedia server.

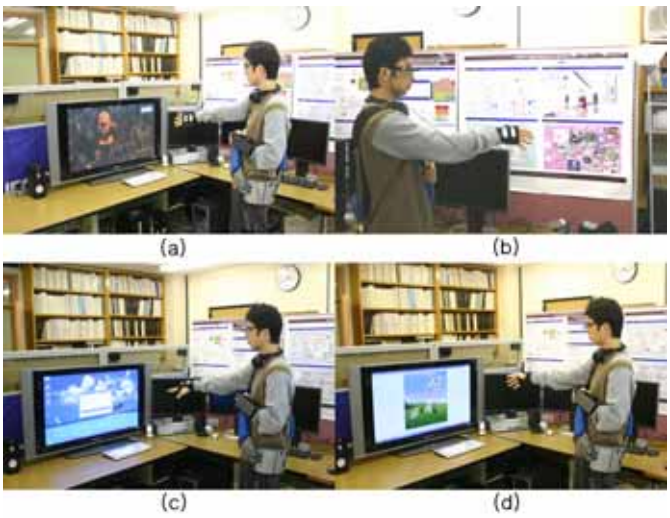

Figure 2. Snapshots of the demonstration

References

[1] Kyu-Ho Park, Seung-Ho Lim, Yong Song, Daeyeon Park, UFC Project Group, "UFC: A Ubiquitous Fashionable Computer," Korea Institute of Next Generation PC, p 142-152, 2005

[2] Michael Reigl, "Point & Click – Interaction in Smart Environments," Handheld and Ubiquitous Computing, p.311-313, 1999.

[3] Matthias Ringwald, "Spontaneous Interaction with Everyday Devices Using a PDA," Workshop on Supporting Spontaneous Interaction in Ubiquitous Computing Settings at Ubicomp, 2002.

[4] Colin Swindells, Kori M. Inkpen, John C. Dill, and Melanie Tory, "That one there! Pointing to establish device identity," ACM symposium on User Interface Software and Technology, 2002

Brief Biography

Kyu-Ho Park received the B.S. degree in electronics engineering from Seoul National University in 1973, the M.S. degree in electrical engineering from Korea Advanced Institute of Science and Technology (KAIST) in 1975, and the Dr.Ing degree in electrical engineering from the Universite de Paris in 1983. He joined the faculty of the Department of Electrical Engineering, KAIST, in 1983.

Web Links

http://core.kaist.ac.kr/UFC/iiufcdemo.html