Chapter XLIV
A Gesture-Based Intuitive Interaction System and its Target Selection Algorithm

Jong-Woon Yoo
KAIST, Korea

Seung-Ho Lim
KAIST, Korea

Yo-Won Jeong
KAIST, Korea

Ki-Woong Park
KAIST, Korea

Yong Song
KAIST, Korea

Gyudong Shim
KAIST, Korea

Jupyung Lee
KAIST, Korea

Kyu Ho Park
KAIST, Korea

ABSTRACT

This chapter presents an intelligent interface system, including a new gesture-based wearable input device called iThrow as a main user interface for mobile devices, and an infrastructure helping users be aware of and make use of various electronic devices in user-friendly manners. In this kind of intelligent interface system, selecting an object among multiple ones is one of the fundamental functions because it is a precursor to all other subsequent actions. We propose a new selection algorithm that improves selection speed by adaptively resizing the objects' angular widths. Results show that the proposed algorithm outperforms the ray-based selection technique in selection speed by about 62.6%.

INTRODUCTION

In recent years, the rapid progress of ubiquitous computing has led to the emergence of various "smart" places, ranging from a smart room (Baek, Lee, Lim & Huh, 2005) to a smart city (Datong, Jie, Robert & Howard, 2007; Velastin, Boghossian, Lo, Jie & Vicencio-Silva, 2005). The smart spaces mainly aim at providing a communication channel between users and computing resources including many devices.

In 2005, our research team launched a project aimed to realize a campuswide ubiquitous computing environment named *U-TOPIA* (Park et al., 2006), where *U* stands for *ubiquitous* and *TOPIA* for a *place* in Greek. We have also developed a wearable computing platform called *Ubiquitous Fashionable Computer* (*UFC*) (Lee, Lim, Yoo, Park, Choi & Park, 2007) as a main personal computing device in U-TOPIA. The ultimate goal of this project is to allow users with mobile computing devices, including UFCs, to be able to communicate with each other and utilize various ubiquitous service devices within U-TOPIA in a user-friendly manner. As a Human-Computer Interaction (HCI) related research in the U-TOPIA project, we are currently working on intelligent interface systems that provide mobile users with easy and natural ways to interact with various smart objects, including public electronic devices such as printers and displays, deployed ubiquitously on the campus and even with users themselves.

This chapter presents an intelligent interface system with a new gesture-based wearable input device called *iThrow*. iThrow is a ring-type wireless input device that is small enough to be worn on one's finger. A user wearing this device can select one of the public devices by pointing to it with iThrow and manipulate it with simple hand gestures without any knowledge of the interfaces or protocols to control it. The underlying hardware/software architecture of our system automatically finds necessary information for communication and manipulation and provides users with a unified gesture-based interface. One important system component is a *location server*, which gathers and manages the location information of both users and public devices, enabling Location-Based Services in our system. The location server manages a virtual map where each device is represented as a specific-sized rectangle. We have also developed *middleware* that interconnects all system components, such as iThrow, UFC (or other mobile computing devices), and the location server, and supports useful functionalities such as *target selection,* a process of finding a device pointed to by a user. We call the pointed device *target* in our context. The middleware automatically finds the target and executes the user's gesture commands on that. In many intelligent interface systems, including ours, target selection is one of the fundamental functions, which decides the system performance because it is a precursor to all other subsequent actions (Steed, 2006). Therefore, we investigate critical issues in existing target selection techniques and propose a new algorithm that improves selection speed by adaptively resizing the objects' angular widths.

iTHROW SYSTEM

The iThrow system is a gesture-based intelligent interface system that provides mobile users with a user-friendly way of interacting with a ubiquitous computing environment. We assume in this context that each person uses UFC as a main user computing device in our system.

Motivation

Due to its small form factor, most portable devices, including our UFC, have only a small-sized display and limited input devices. UFC has a 2.5" LCD display at the sleeve of the clothes and 12 input buttons, as shown in Figure 1, which are definitely insufficient to easily use UFC such as to monitor

Tissue Image Classification Using Multi-Fractal Spectra
Ramakrishnan Mukundanand Anna Hemsley (2010). *International Journal of Multimedia Data Engineering and Management (pp. 62-75).*
www.irma-international.org/article/tissue-image-classification-using-multi/43748