Quantitative (objective) evaluation of human interface for computer systems; design and implementation of easy-to-use computer systems

Hiroyasu KAKUDA Laboratory

Hiroyasu KAKUDA

Summary of Research

Design and Implementation of Easier-to-use User Interface

When people hear the term *computer input device*, a keyboard and mouse come instantly to mind for most. However, are a keyboard and mouse—which novice users often find difficult to use—really the best input devices?

Our laboratory promotes research on the design and implementation of easier-to-use user interface for human-computer interaction (HCI) to achieve more effective interaction between people and computers.

Research and Development Related to Handhelm for One-handed Input

We are developing input devices as part of our research of user interface. One example of such devices is a Japanese *kana* character keyboard designed for one-handed input. This keyboard is an input device designed for a totally new style of input: Vowel characters are entered with the index finger, the sonant mark with the thumb, and consonant characters using other fingers. This keyboard enables the input of 180 *kana* characters per minute, performance comparable to a two-handed keyboard. An advantage of one-handed input is that it leaves the other hand free, allowing the user to manipulate the mouse while entering characters.

Handhelm is an advanced form of one-handed keyboard. On Handhelm, the circularly arranged buttons are assigned consonant and vowel characters for one-handed input. Integrated with pressure sensors, the buttons can also be used to control the cursor and do other editing functions, such as deleting characters. In addition, Handhelm is equipped with a gyro to detect horizontal motion and an accelerometer to detect vertical motion. It can be used in almost the same way as a Wii remote controller. Mobile phone users should be able to use and operate Handhelm comfortably in about one hour.

We are engaged in research on various other input methods and systems, including electronic pens, wearable keyboards, and touchpads.

Handhelm is a new type of input device.

Research on SHoes E-learning System

In addition to input devices, as part of our efforts to design and create easy-to-use systems, we study education support systems. One, the Sheet Oriented Education System (SHoes) e-learning system, is designed to serve as a lecture support system that enhances teaching effectiveness. Associate Professor Kakuda already uses this system in his lectures.

SHoes displays reference data used by the lecturer on student PCs connected to the system via the net-

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Affiliations	Information Processing Society of Japan; Japan Society for Software Science and Technology; Institute of Electronics, Information and Communication Engineers; Japanese Cognitive Science Society; Human Interface Society; Human Centered Design Organization
Member	Hiroyasu Kakuda, Associate professor Hideo Akaike, Research Associate

work. This eliminates the need for students to manually copy down notes from lecture materials and allows the addition of memos to the materials. Since the system can be controlled by students, each student can make the necessary adjustments based on his or her level of understanding. The system allows students to return to previous pages, allowing them to learn at their own pace and thereby make the most of the lecture. To ask a question, a student summons the bulletin board function. The student simply touches the screen to ask a question, even in large classrooms.

SHoes also provides convenient, well-thought-out functions for lecturers/teachers, including an AGREE button for identifying student understanding and an automatic test result aggregation function for quizzes. SHoes provides significant added value beyond what can be achieved by existing lecture presentation methods. What's more, system requirements on the student side are modest: a network connection and a web browser (Firefox). SHoes is a highly versatile system.

Advantages

Developing Software Using Data Accumulated from the Advent of the PC

Associate Professor Kakuda has experience developing editor software. Since those early years, he has often been disappointed with the inefficient character input system of the PC. To develop better methods, he devised various input systems, collected data on input operations, analyzed the data collected, and searched for clues to accelerate input. His expertise in the area of input devices is a major asset of our laboratory.

Modifying Hardware to Create Innovative Equipment

Another strength of our laboratory is the ability to modify hardware. We modify existing input devices, such as video game controllers, to create innovative new input devices. We believe the functions provided by the interactive software developed by our laboratory will prove especially useful in the framework of joint research efforts with hardware manufacturers to create new devices.

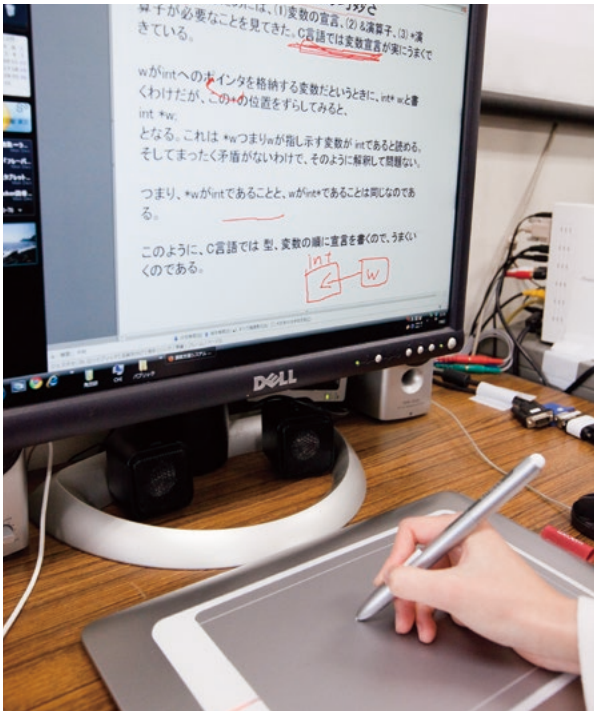
Future Prospects

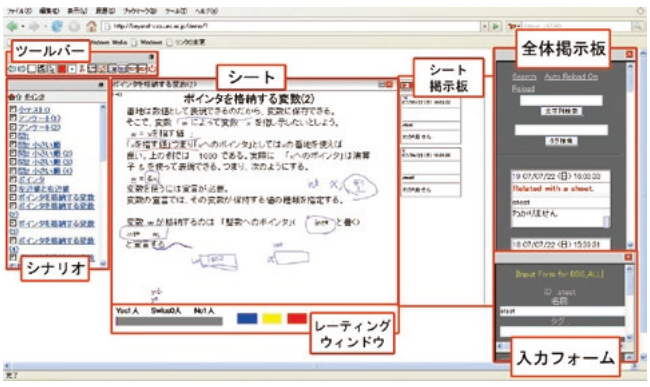
Incorporating our Original Technologies into Actual Products and Establishing Indices for Objective Assessments of Input Operations

Our future goals include commercializing our technologies as products. For instance, in collaboration with a mobile phone company, we are interested in creating a totally new input environment for mobile phone users by designing Handhelm for use as the input section of mobile phones.

Another goal is to establish indices for objective assessments of ease of use. This project involves statistical analysis of data obtained in input experiments with human users, designing input procedures to minimize wasteful human movements (sequence), and producing an input model (indices). Once this model is completed, we will be able to calculate the time required to complete an input procedure without performing an actual input test.

Prototype of Handhelm for one-handed input





The SHoes e-learning system