Touch Interface on Back of the Hand

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1 Introduction

In this paper we propose a new computer–human interface which uses the back of the hand for pointer control.

Recently we can use many touch based interface including touch pad on PCs, cell phones, tablet devices and portable games. With these devices, they can arrange many different types of buttons on the screen depending on applications. It enables small devices to achieve various functions on a small screen.

There is one drawback for these touch panel devices. Users cannot feel haptic feedback like "click" since they do not have physical buttons. As a result, it is difficult to input data without any visual or auditory cues. User cannot input date while they are walking, for example.

In order to solve the issue, we propose a new interface which uses the back of the hand as an input surface of pointing device. If we utilize our skin as an input surface, we can feel and perceive which area is tapped.

There are previous researches that used user's body as an input interface. Harrison et al. proposed "*Skinput*" which detects tapping sound with microphones put on the skin surface to localize tapping position [Harrison et al. 2010]. User can input command by changing the tapping position on their body.

We apply the similar idea to the small area: opisthenar (back of the hand). The area is relatively flat and user can use there like a conventional touch pad device. User can feel a precise tactile feedback since the sensitivity of a hand is higher than the other body parts. One of the important advantages is that many people use a wristwatch. If we improve a wristwatch so that it can detect finger position on the opishtenar, we do not need additional external devices. Since we used IR reflection for detecting finger position, our device can be used not only for the back of the hand, but for any flat surfaces.

In our demo, we show how it works. We also show how easy you can input data by using your body with a wristwatch size device.

2 Prototype System

Figure 1 shows our system. It consists of three parts. One is a position detection unit. We used an infrared reflector for measuring two dimensional position of finger on the back of the hand. We put 7 infrared LED–detector pairs at the side of the wristwatch. The basic principle of finger position detection has been also used in "*SideSight*"[Butler et al. 2008]. The second unit is a piezoelectric sensor which detects tapping sound on the opisthenar. It might possible to detect tapping motion only from the infrared sensors, however, it becomes easy and robust when we use a piezoelectric sensor in addition. The sensor also can detect friction sound. This can be used for identifying various gestures on the back of the hand. The third unit is the display. We can control the cursor on the screen just beside the screen. It makes user easy to input data to small devices.

Figure 1: Touch interface device. A user can input date by touching the back of the hand. The user can feel the position of the manipulation from his/her own hand, the system do not need any tactile display device to give "touch" sensation.

3 Applications

We showed one example of application. A user can control his/her presentation slides with our proposed interface. The device can make it easy to control the slides.

Since we can know the contact position by tactile perception at the opisthenar, we do not need to see the surface for input. This advantage can be used when a user is walking on the street, for example. The user can change music or call someone by touching his/her back of the hand.

Acknowledgements

This work was supported in part by Grant–in–Aid for Young Scientists B (21700185) and Grant–in–Aid for JSPS Fellows (21-5508) in Japan.

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SIGGRAPH 2011, Vancouver, British Columbia, Canada, August 7 – 11, 2011.
ISBN 978-1-4503-0921-9/11/0008