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iSkin: Stretchable On-Body Touch Sensors for Mobile Computing

Martin Weigel, Jürgen Steimle

Max Planck Institute for Informatics and Saarland University, Saarbrücken, Germany

Abstract

This demo presents iSkin, a stretchable and visually customizable sensor that capture touch input on the human body for mobile computing. iSkin is a thin skin-worn sensor overlay, made of biocompatible materials. The sensor can be produced in different shapes and sizes and is visually customizable to account for the user's aesthetic preferences. It can be worn on various locations on the human body, including the finger, the back of the hand, and the ear. Each sensor overlay supports single and multiple touch areas, which can be arranged to more complex multi-touch widgets. Together, these attributes allow for novel device concepts that support fast and direct on-body input for mobile computing.

1 Introduction

Minimization of electronics makes technology increasingly smaller and more mobile. One of the downsides of this transformation is the decrease in input capabilities. Wearable devices tend to offer too little surface area for effective touch control, the primary input method for precise and discreet interaction with current mobile devices. An emerging research stream in Human–Computer Interaction proposes human skin as an input surface for mobile computing. As the largest human organ it allows for a large input surface and is most often easy to reach and to interact on. An elicitation study has shown that multi-touch and other input modalities such as pressure can provide expressive input for mobile and wearable devices (Weigel et al. 2014).

iSkin is a novel skin-worn sensor technology to leverage the body as an input surface for mobile computing (Weigel et al. 2015). The sensor technology is based on advances in electronic skin (e-skin) (Hammock et al. 2013) and enabled by new rapid-prototyping techniques for soft-matter electronics (Lu et al. 2014). Flexibility and stretchability are important properties for the sensor to be worn comfortably on the deformable skin. The sensor is made of thin, sandwiched layers of silicone (PDMS) and carbon-doped silicone (cPDMS). Both materials are biocompatible and safe to wear as an on-skin overlay.

The sensor can feature one or multiple interactive areas. These can be combined to more complex widgets, such as sliders and click wheels. The sensor design allows to distinguish light touch from firm pressure. The input can be used for “always available”, fast and discreet interactions, either as a standalone device or as an input surface for other devices, such as smartphones, smartwatches and head-mounted displays.

2 Application Examples

iSkin enables several classes of novel on-body devices: interactive straps around a body part, extensions to body-worn devices and self-adhesive interactive stickers. In our demo, we present five example prototypes of iSkin:

MusicSticker: A self-adhesive sticker worn on the forearm containing five interactive controls for a music player inside a visual aesthetic design.

FingerStrap: A strap worn around the index finger to allow for eyes-free, one-handed discreet interaction. It includes three buttons and a slider.

Rollable Keyboard: Rolled-up next to a smartwatch the keyboard takes up only little space, but expands to a full-size on-demand QWERTY keyboard. This allows for typing on larger keys without occluding the small display.

ClickWheel: A rotation wheel with four interactive areas to control a music player.

EarSticker: A sticker conforming to the backside of the ear to control headsets.

To sum up, we will demonstrate iSkin, a flexible and stretchable on-body touch sensor. We will show several sensor prototypes showing a wide variety of body locations supported by iSkin. Each requires different sizes, shapes, various degrees of flexibility and stretchability. Furthermore, the sensor design takes the importance of visual aesthetic into account and allows for visual customization of the sensor. We already presented the sensors at ACM CHI’15 and at CeBIT 2015. We hope this demo helps to spread the interest in this novel sensor class in the Mensch und Computer community as well. Especially, we hope to see the soft-matter sensor technology being used for other on-body applications and the sensor potentially transferred to other domains of Human–Computer Interaction.

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Contact

Martin Weigel and Jürgen Steimle
Max-Planck-Institut für Informatik
Cluster of Excellence MMCI
Campus E1.7, 66123 Saarbrücken

http://embodied.mpi-inf.mpg.de

{mweigel, jsteimle}@mpi-inf.mpg.de