

Grabrics

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A Foldable Two-Dimensional Textile Input Controller

Context

Textile sensors can be integrated ubiquitously into fabrics that surround us. So far, existing interfaces transfer concepts such as buttons and sliders to the textile domain. But **fabric materials have unique characteristics and affordances** that can be leveraged to define a rich gesture alphabet for fabric interfaces. We developed Grabrics, a two-dimensional textile sensor that is **manipulated by grabbing a fold and rolling it** between the fingers. Grabrics can be integrated invisibly into everyday textile objects while **minimizing accidental activation**.



User Interaction



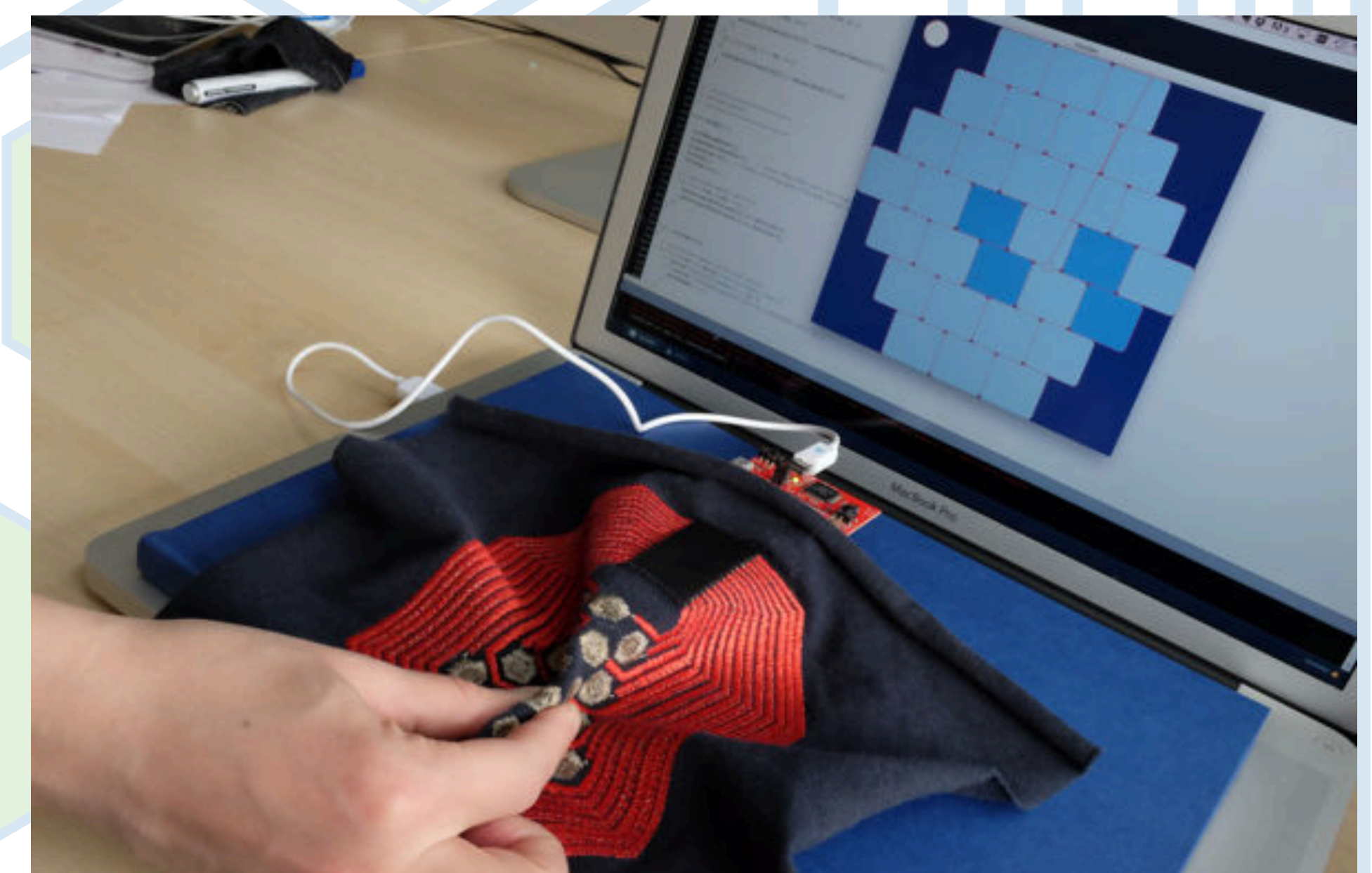
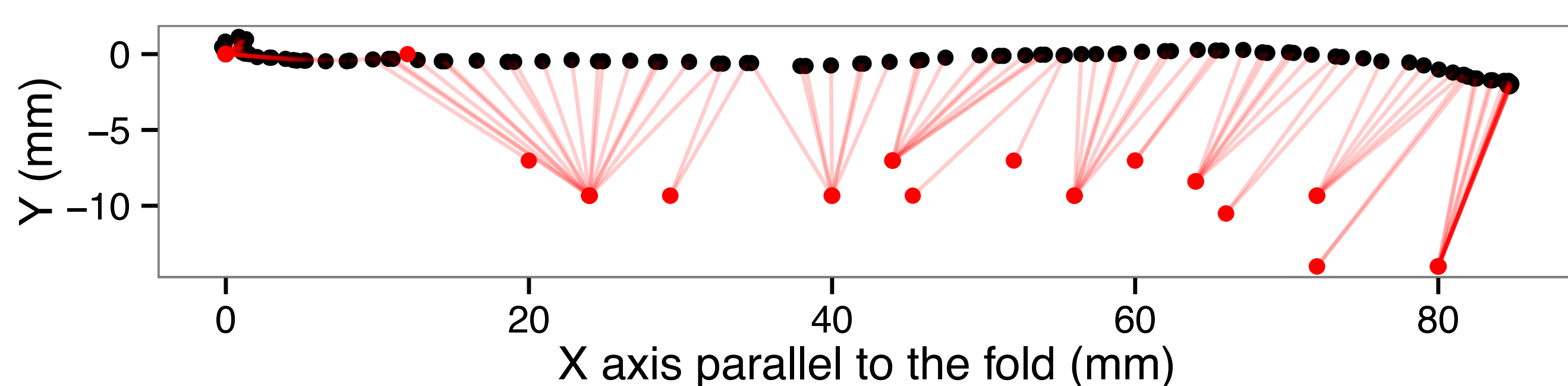
Implementation

We implemented Grabrics as a displacement-to-velocity input device to mitigate its limited input resolution and operating range. The sensor is activated by an explicit fold gesture and manipulated continuously by a slide gesture over the fold.

Sensor

Grabrics is a resistive textile sensor that, except for the sensing microcontroller, is entirely made of textile materials. The sensor consists of 30 pads of conductive yarn embroidered onto a piece of cloth.

Grabrics has a limited input resolution due to the type of conductive thread, the manufacturing and embroidery process, and the electrical connections around the sensor. The plot shows a motion trace from Vicon (black) and Grabrics (red) in the input space. Each line connects the trace from the same timestamp.



Algorithm

A. Detect sensor activity

B. Detect fold (PCA)

C. Measure direction & displacement

D. Output direction & acceleration

