

# Tailored but versatile, simple but powerful: Insights and Challenges in Designing Wearable Toolkits

Andreas Peetz<sup>1,2</sup>, Konstantin Klamka<sup>1</sup>, Raimund Dachzelt<sup>1,2</sup>

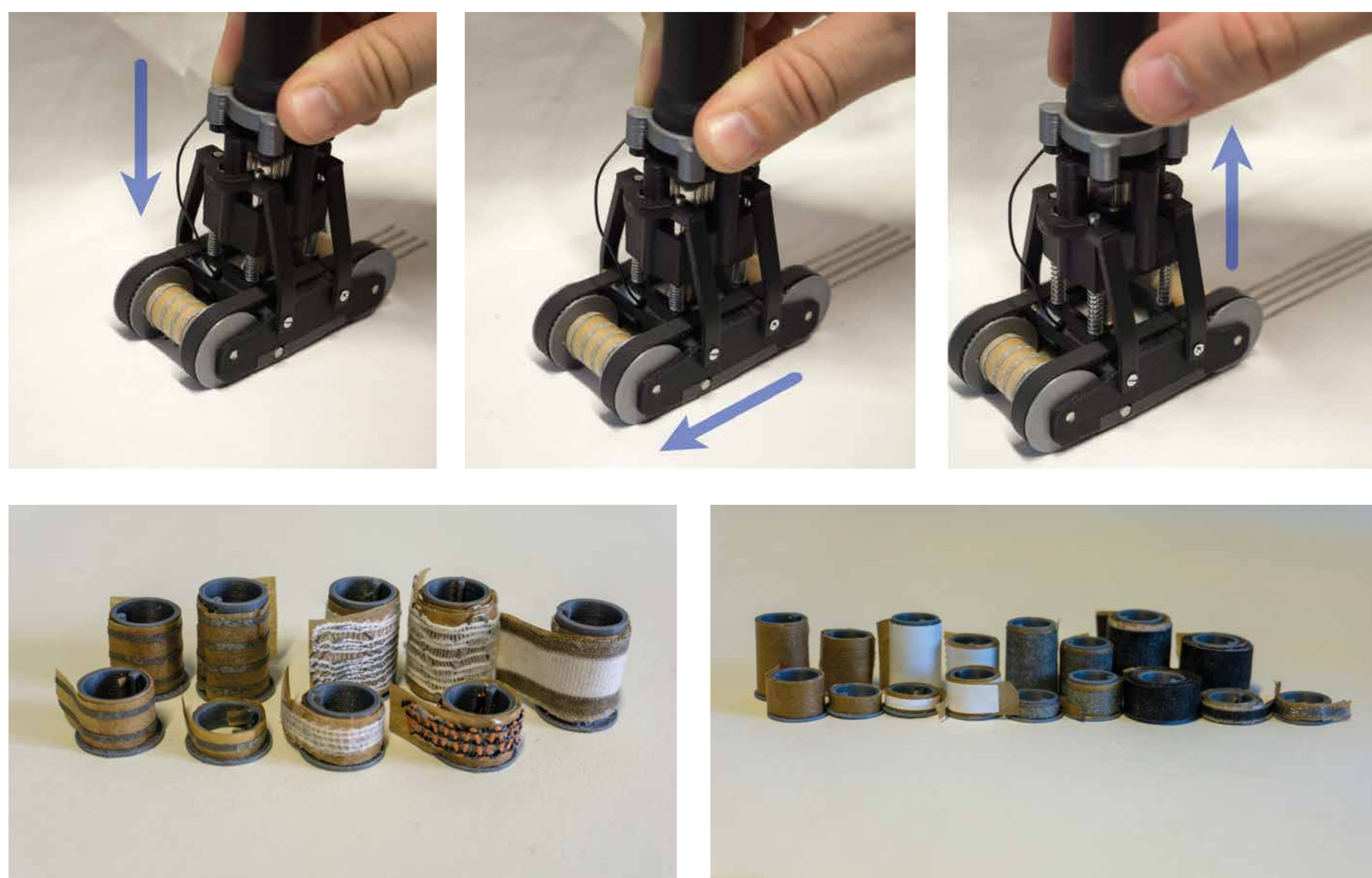
<sup>1</sup> Interactive Media Lab, Technische Universität Dresden    <sup>2</sup> Centre for Tactile Internet with Human-in-the-Loop (CeTI)



## Motivation

Prototyping and exploring novel body-worn interfaces remains a challenge, as we do not yet know exactly how to collaboratively design, flexibly customize, integrate, and finally reuse or recycle them in a sustainable way. While the next generation of body-worn interfaces should be tailored and simple, but also versatile and powerful, some paradigms even seem contradictory. With this work, we aim to share design considerations and findings from our two research projects Rapid Iron-On User Interfaces (RIO) and BodyHub to discuss current challenges in wearables toolkit development along three research questions.

### The audience and purposes of wearable toolkits



Easy to use hand-held ironing tool and functional tapes from the Rapid Iron-On User Interfaces (RIO) Toolkit. Developed for and evaluated with textile designers and researchers.

## How do we develop toolkits that support users with different skills and goals?

- Lower barriers for everyone to create individual wearable solutions
- Easy-to-use tools, methods, and components for emerging toolkits
- Adaptability to custom use cases in diverse settings



Prototype created with the RIO Toolkit: Messenger Bag with ironed-on solar cells, LEDs, capacitive controls, bend- and moisture-sensor.

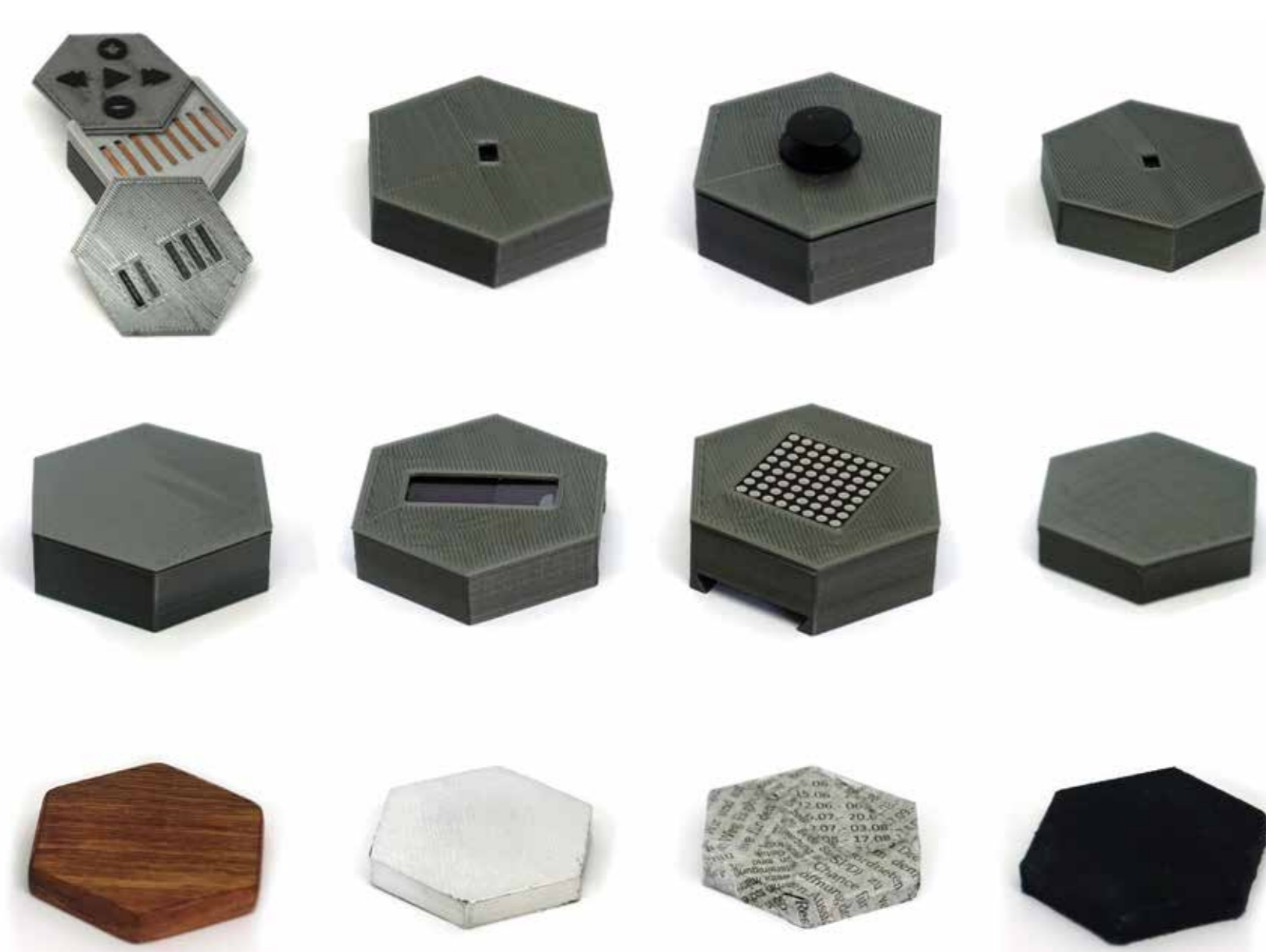
### Toolkits' impact on wearable designs

## How can we support reconfigurability for designers and end users?

- Modularity vs. Reconfigurability
- Reconfigurable toolkits: Reversible connectors as a key component
- User-defined interaction mapping: Complexity vs. Ease of use



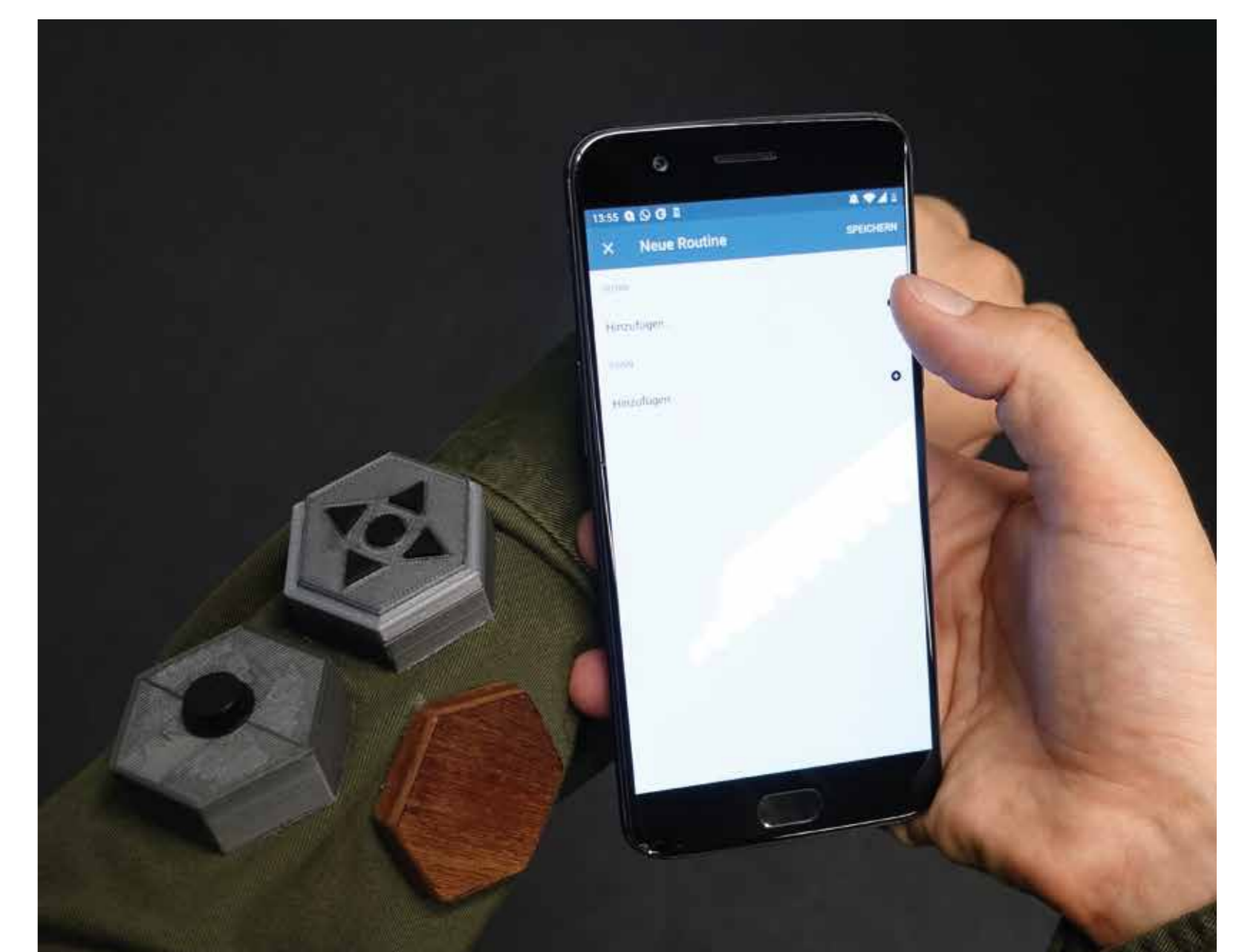
Example use cases of BodyHub ranging from tactile feedback to remote control and object recognition.



BodyHub's modular design allows the creation of individual wearable solutions with a variety of input and output options.

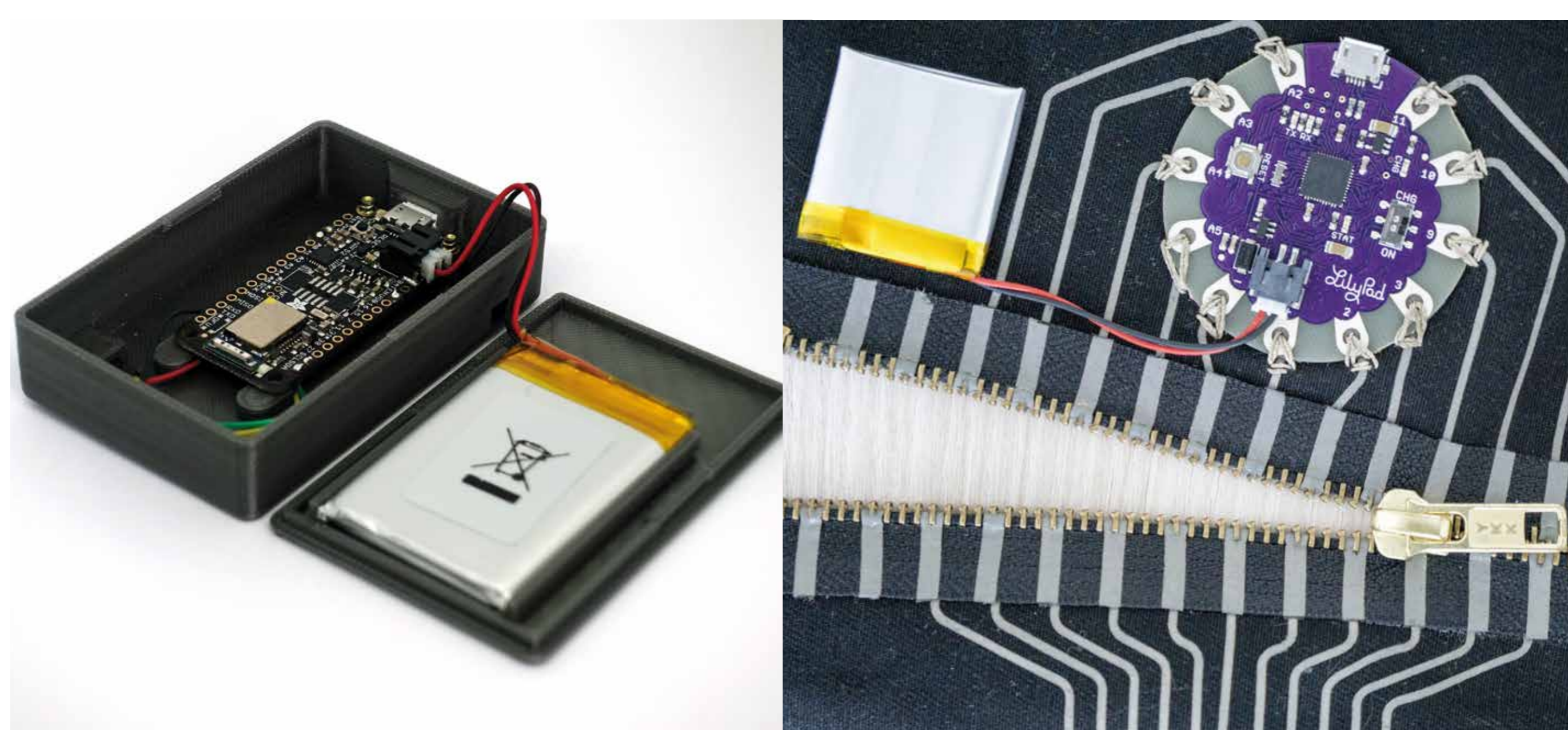


By simply clicking the modules into the embedded sockets, individual applications can be created and rearranged at runtime.



The app that accompanies BodyHub makes it easy to define custom functions according to the If This Then That principle.

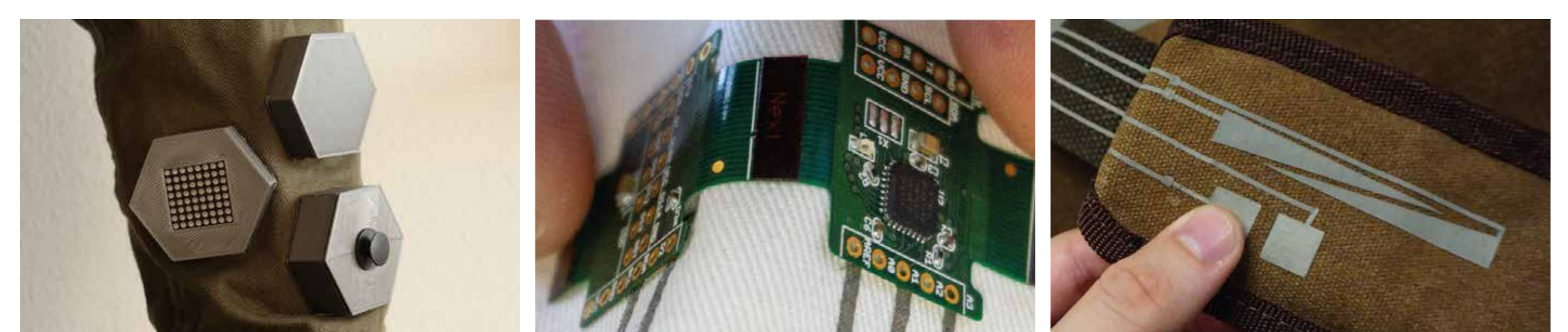
### Impact of wearable toolkits on sustainability



Hybrid solutions with detachable central units (left: BodyHub, right: RIO) can be used with multiple enhanced garments, which can be a first step towards sustainable wearable toolkits.

## What level of integration is appropriate for emerging toolkits?

- Level of integration: Rigid, flexible, or fully integrated?
- Sustainability of wearable toolkits
- Hybrid solutions with detachable modules and tech-enabled garments



In our two projects, we have tested different levels of integration: from rigid components (BodyHub - left) to flexibly integrable, and smart materials (RIO - center, right).