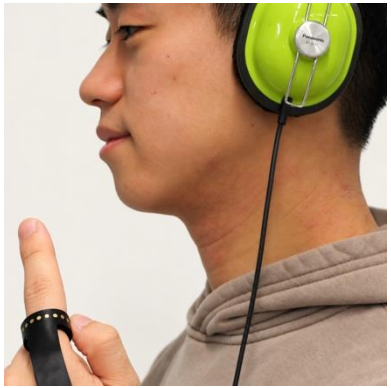
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These are the slides for the talk presented at UIST 2026 by Lonnie Chien.
All the links in this PDF are clickable and lead you to YouTube videos, paper, etc.
You can watch the live talk here: https://youtu.be/38WvdmhBSvc
You can watch the demo video here: https://www.youtube.com/watch?v=A84YTddc8Ls
If you need a PPTX/editable version for your class, email us hci@uchicago.edu
More information on this paper (or others of our lab) at: https://lab.plopes.org/#RingIO



RingIO: An Eyes-Free Smart Ring with Inputs via Touch and Outputs via Touch
Lonnie Chien, Pedro Lopes. In Proc. UIST'26 (paper)
Smart rings are popular (e.g., 5.5 million Oura rings sold in a few years), but their small size and limited power make traditional outputs like screens or vibration motors impractical. RingIO explores electrotactile stimulation, a very low-power form of haptic feedback, as an alternative. The prototype ring uses double-sided electrodes that sense touch on one side and deliver electrotactile animations on the other, enabling eyes-free input and output in the same place. In a user study, participants recognized the ring's animations with up to roughly ~90% accuracy, making it useful for a whole new range of applications not currently possible in today's smart rings.

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RingIO: An Eyes-Free Smart Ring with **Inputs via Touch** and **Outputs via Touch**

Lonnie Chien and Pedro Lopes

THE UNIVERSITY OF CHICAGO

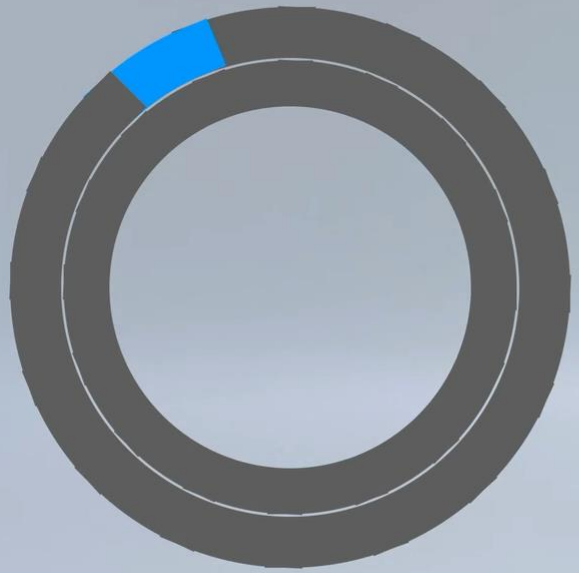


this user is wearing **RingIO**



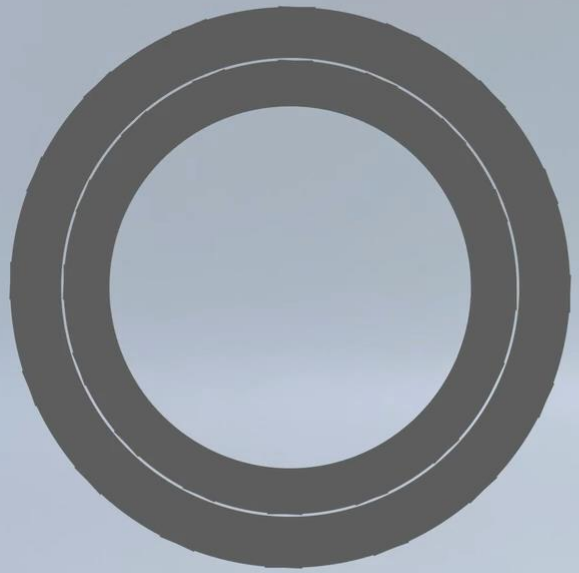
watch: https://www.youtube.com/watch?v=A84YTddc8Ls

it features touch-based **input** (via capacitive sensing)





watch: https://www.youtube.com/watch?v=A84YTddc8Ls





watch: https://www.youtube.com/watch?v=A84YTddc8Ls

motivation

so why did we build Ring IO?

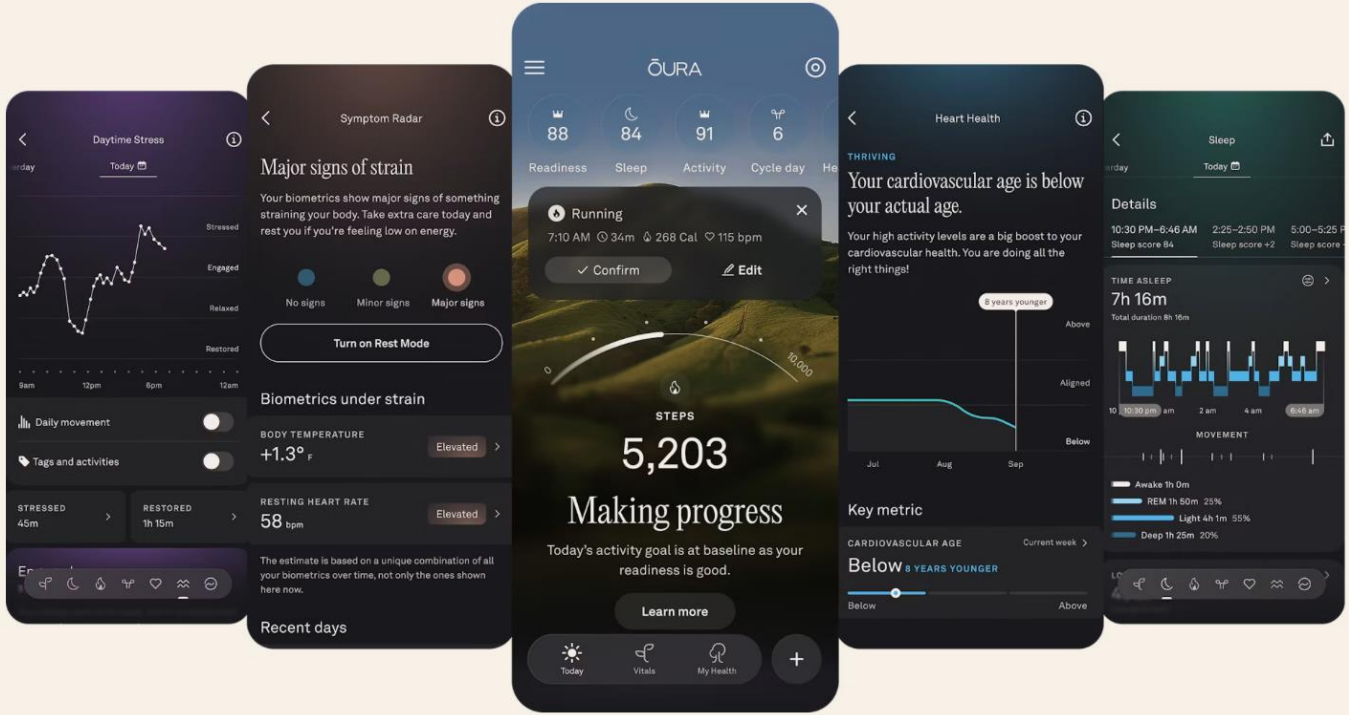


Oura Ring 5

accurate vital sensing
supports wellness & fitness goals
discreet & minimal form factor
only passive sensing—no I/O interaction



Oura Ring 5

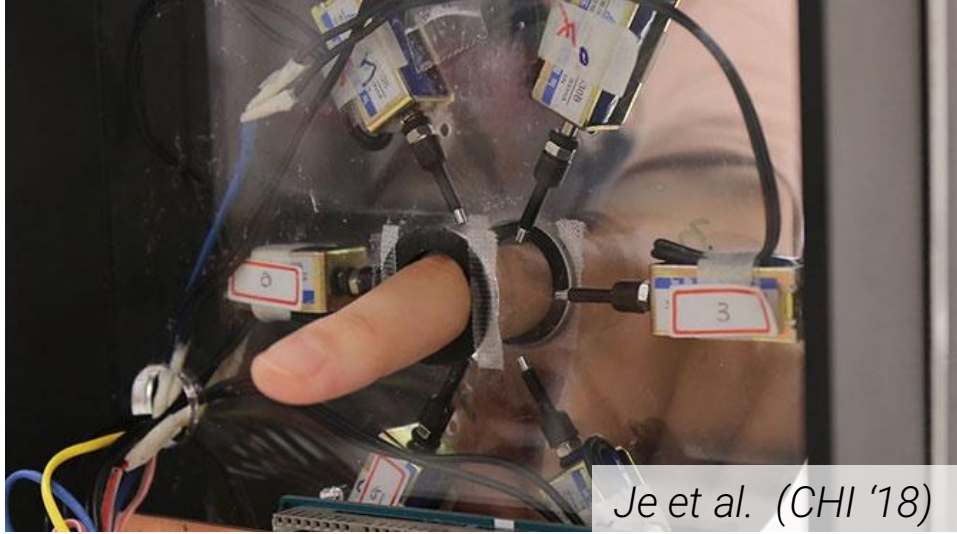

Daytime Stress
Today
Stressed
Engaged
Relaxed
Restored
9am
12pm
6pm
12am
Daily movement
Tags and activities
STRESSED
45m
RESTORED
1h 15m
Symptom Radar
Major signs of strain
Your biometrics show major signs of something straining your body. Take extra care today and rest you if you're feeling low on energy.
No signs
Minor signs
Major signs
Turn on Rest Mode
Biometrics under strain
BODY TEMPERATURE
+1.3° F
Elevated
RESTING HEART RATE
58 bpm
Elevated
The estimate is based on a unique combination of all your biometrics over time, not only the ones shown here now.
Recent days
ŌURA
88
Readiness
84
Sleep
91
Activity
6
Cycle day
Running
7:10 AM 34m 268 Cal 115 bpm
Confirm
Edit
STEPS
5,203
Making progress
Today's activity goal is at baseline as your readiness is good.
Learn more
Today
Vitals
My Health
Heart Health
THRIVING
Your cardiovascular age is below your actual age.
Your high activity levels are a big boost to your cardiovascular health. You are doing all the right things!
8 years younger
Above
Aligned
Below
Jul
Aug
Sep
Key metric
CARDIOVASCULAR AGE
Current week
Below 8 YEARS YOUNGER
Below
Above
Sleep
Today
Details
10:30 PM–6:46 AM
Sleep score 84
2:25–2:50 PM
Sleep score +2
TIME ASLEEP
7h 16m
Total duration 8h 16m
10:30 pm
2 am
4 am
6:46 am
MOVEMENT
Awake 1h 0m
REM 1h 50m 25%
Light 4h 1m 55%
Deep 1h 25m 20%

related work

why aren’t smart rings more interactive?



Ariza Nunez et al. (ICAT-EGVE ‘15)



Je et al. (CHI ‘18)



Je et al. (CHI ‘17)



Han et al. (UIST ‘18)

our approach

building Ring IO

multiplexed electrotactile
stimulation and capacitive touch



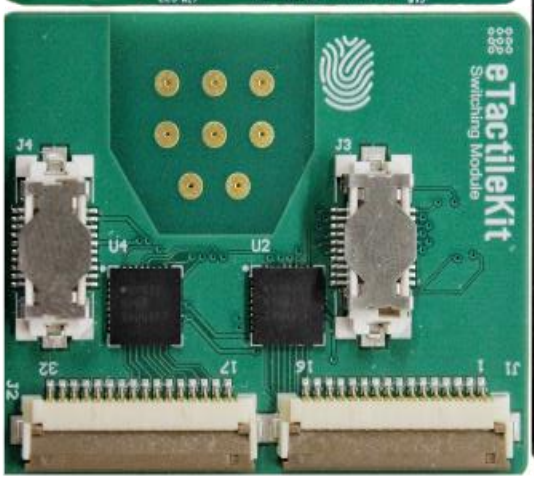


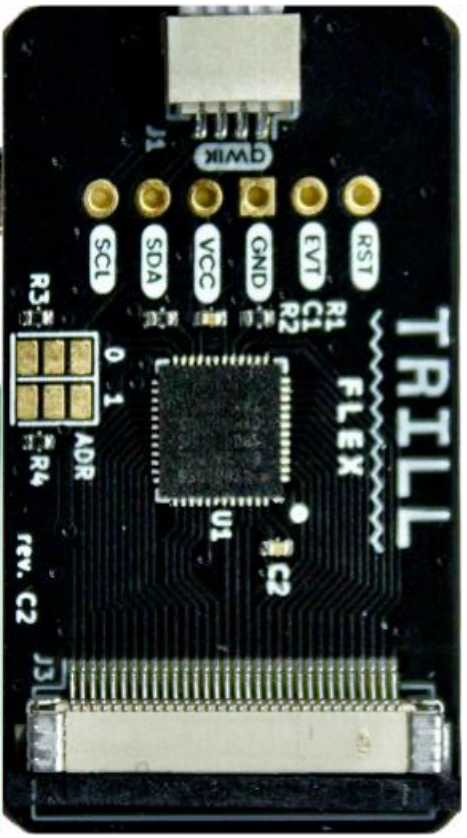


16-ch stim

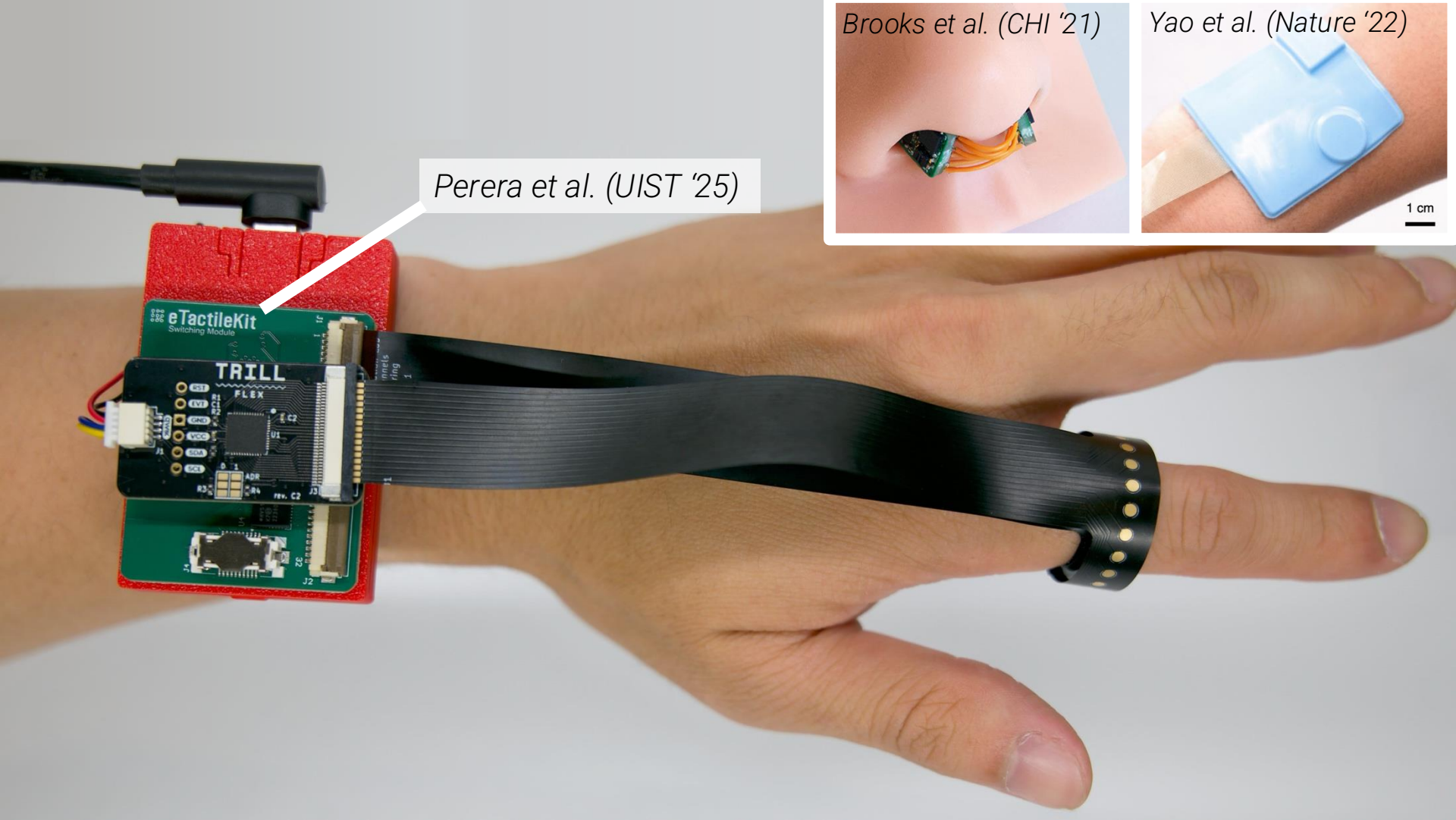
16-ch touch





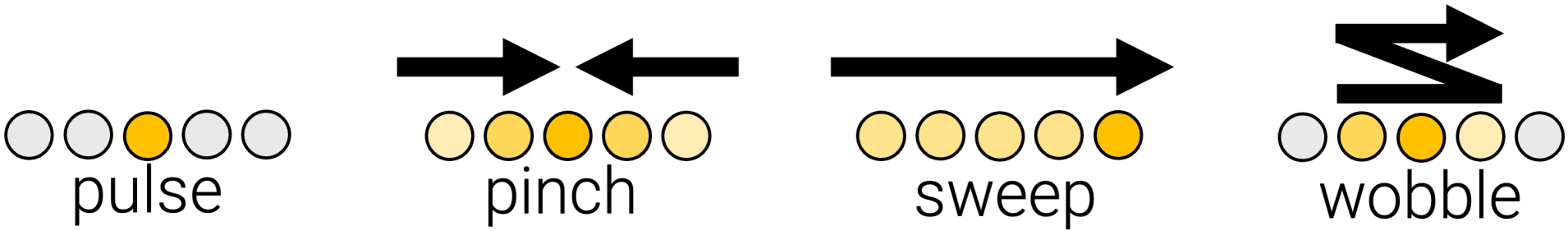


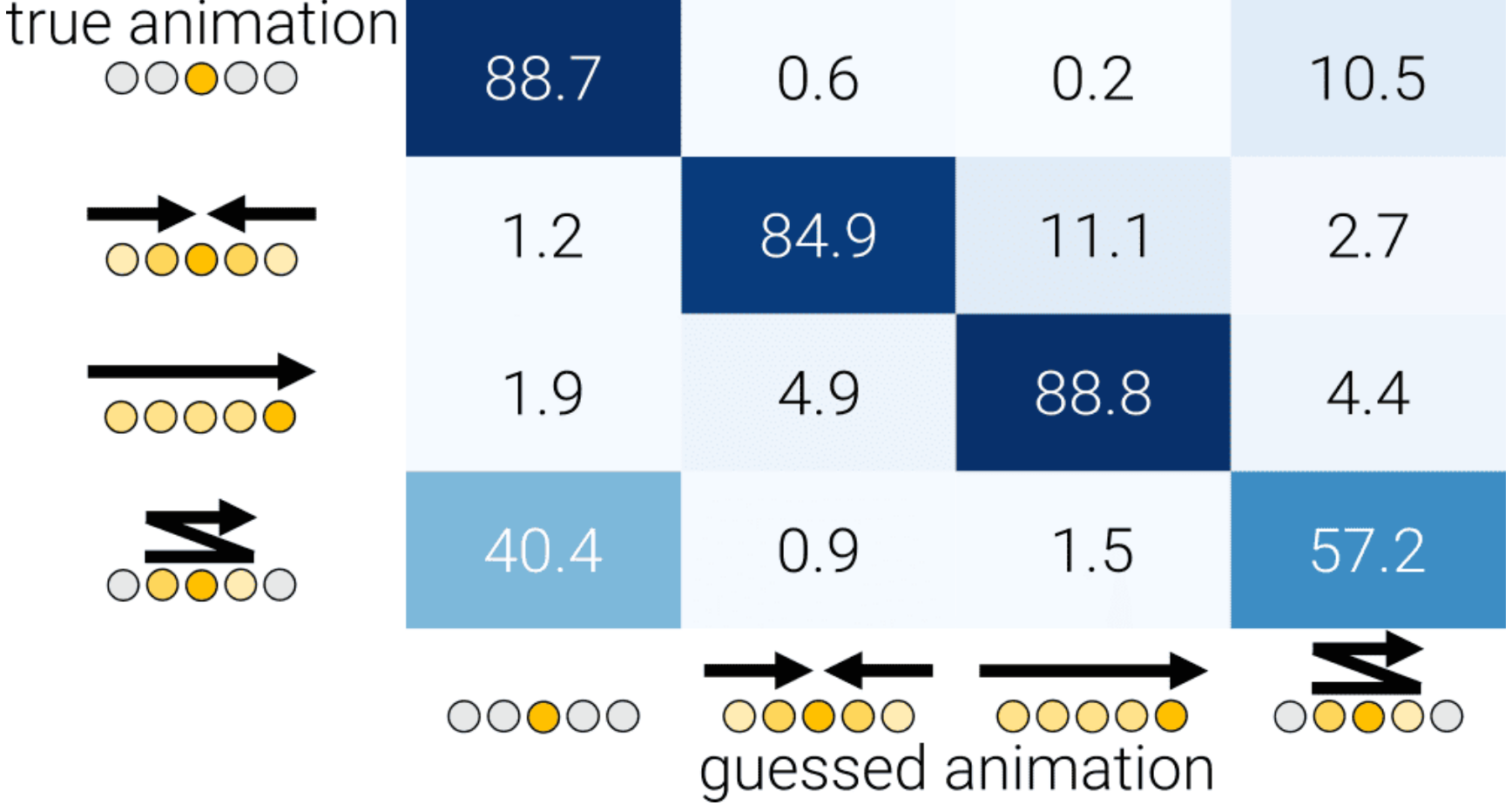

TRILL
FLEX
eTactileKit
Switching Module

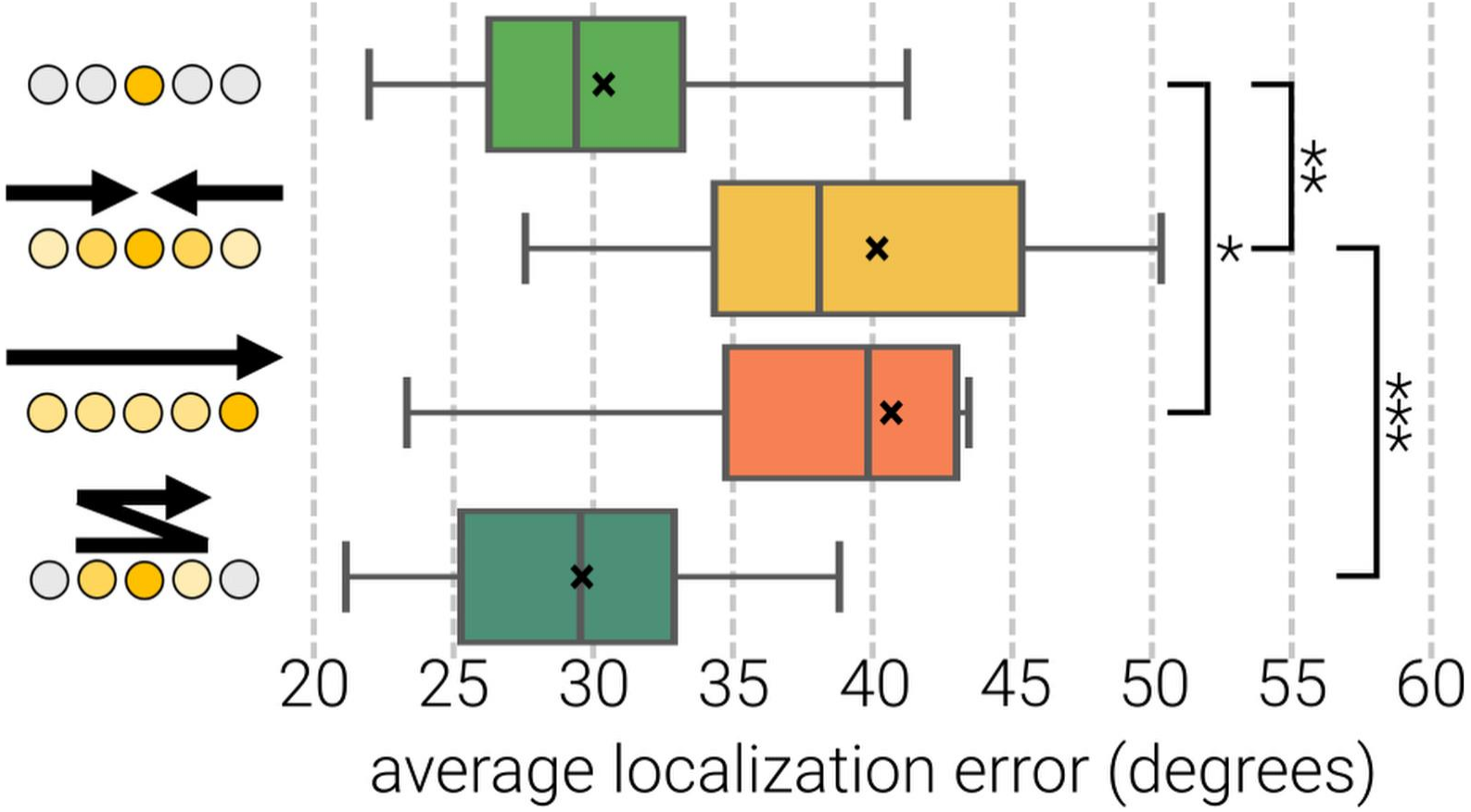

Brooks et al. (CHI '21)
Yao et al. (Nature '22)
1 cm
Perera et al. (UIST '25)
eTactileKit
Switching Module
TRILL
FLEX

validation

so: can users perceive animations? can they localize feedback?


pulse
pinch
sweep
wobble


true animation
88.7
0.6
0.2
10.5
1.2
84.9
11.1
2.7
1.9
4.9
88.8
4.4
40.4
0.9
1.5
57.2
guessed animation

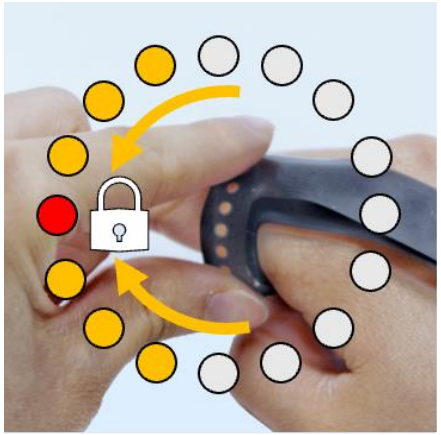

*
**
***
20
25
30
35
40
45
50
55
60
average localization error (degrees)

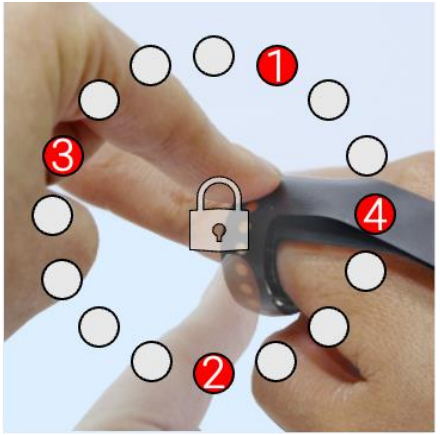
applications

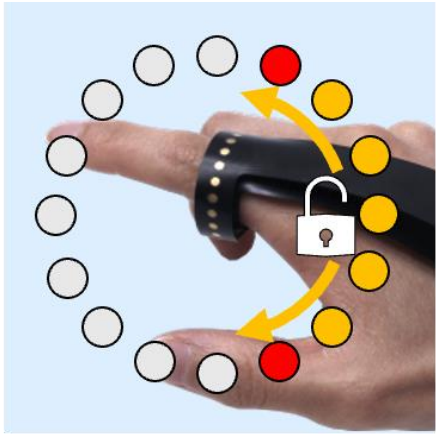
exploring what could be enabled with more interactive rings

applications

eyes-free authentication







user inputs a **passcode**
by touching (with collocated feedback)



watch: https://www.youtube.com/watch?v=A84YTddc8Ls

rippling-open animation confirms **unlocking**



watch: https://www.youtube.com/watch?v=A84YTddc8Ls

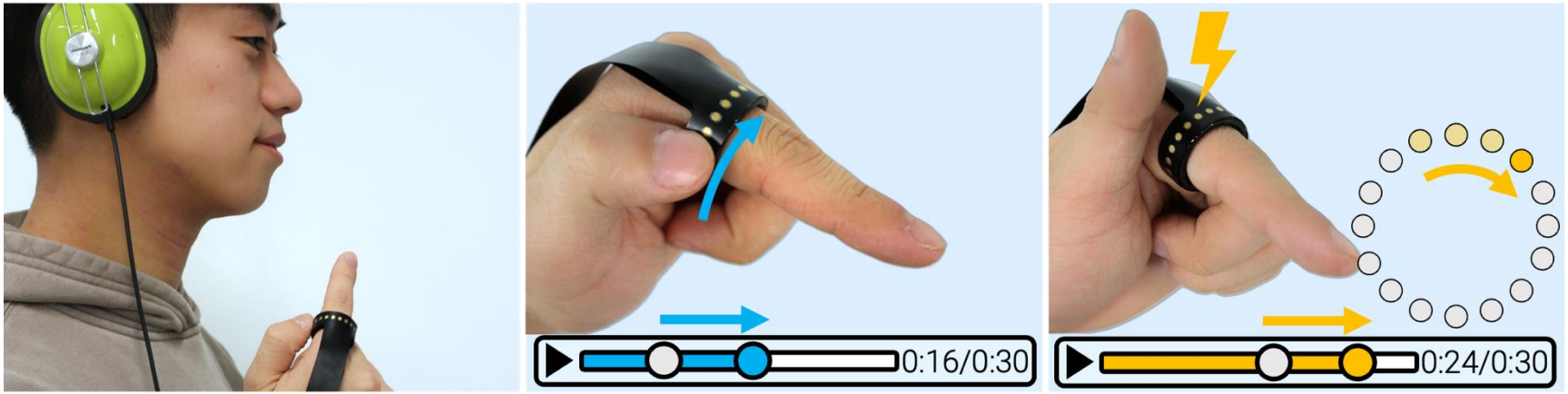




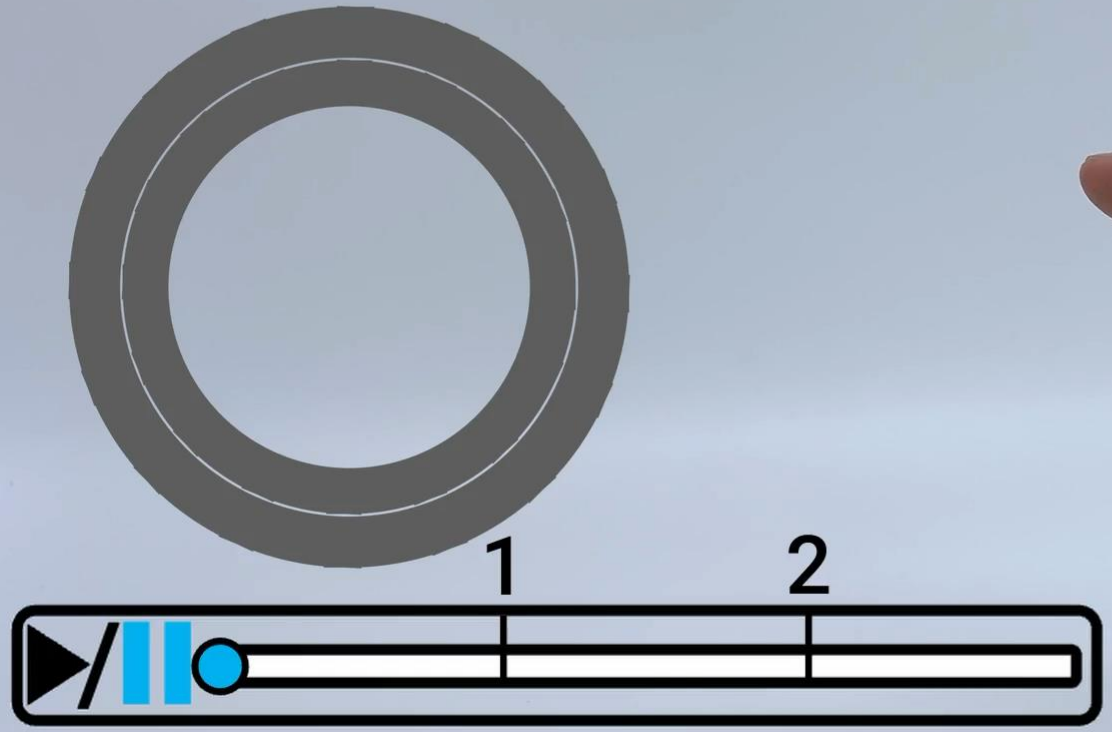
watch: https://www.youtube.com/watch?v=A84YTddc8Ls

applications

eyes-free media controller



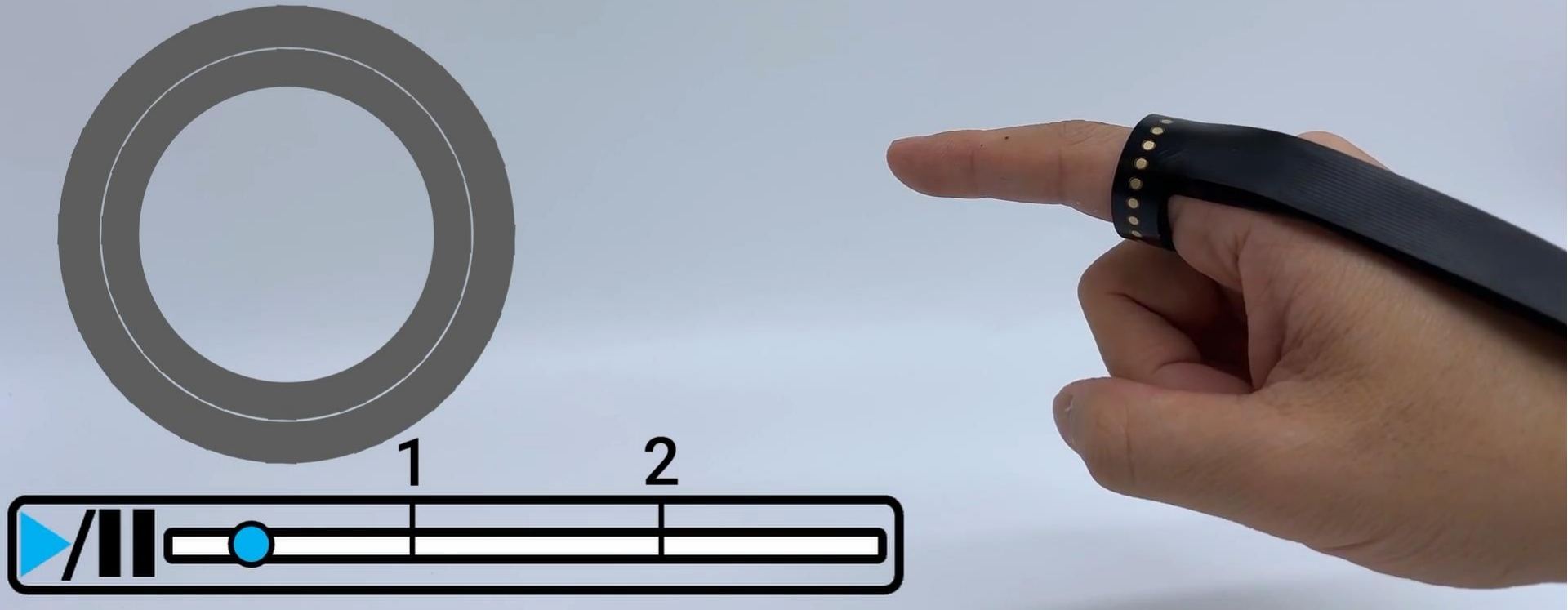
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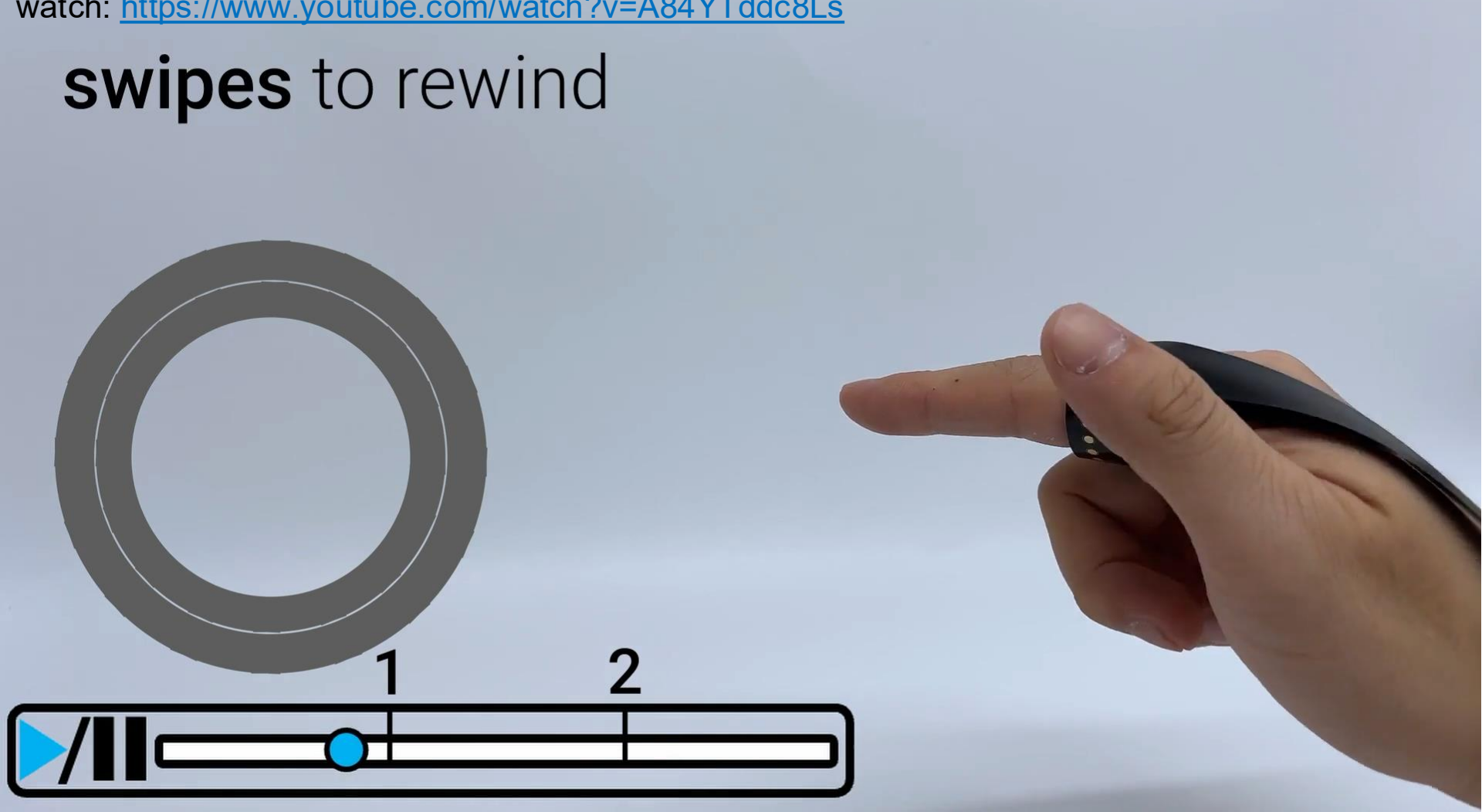


watch: https://www.youtube.com/watch?v=A84YTddc8Ls

holds to check playback position

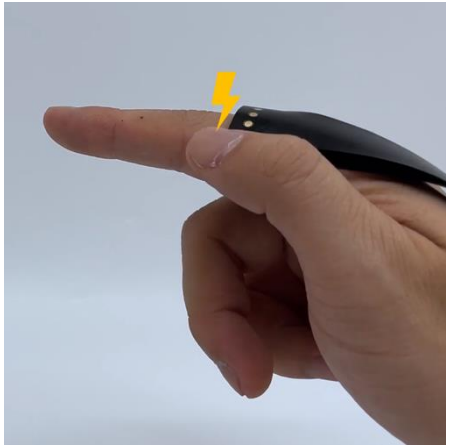


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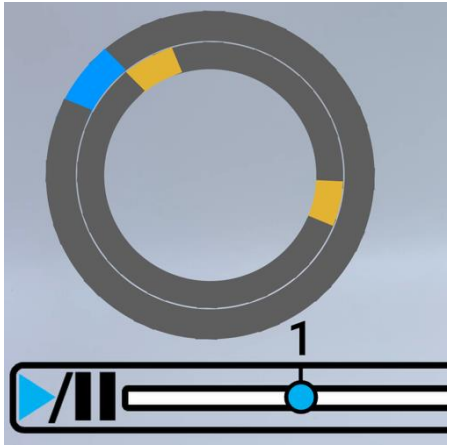


miniaturized haptics for smart rings



collocated **touch**-based I/O

symmetric interaction paradigm



eyes-free applications

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(72) Inventor: **D'ANNA, Edoardo**; Elektroniikkatie 10, 90590 Oulu (FI).

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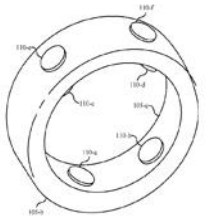
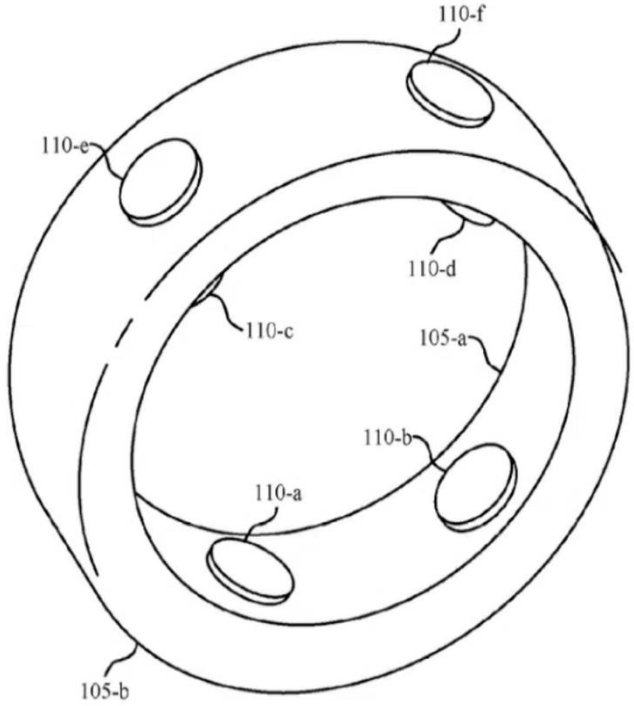


FIG. 1

(57) **Abstract:** Methods, systems, and devices for electrical stimulation for haptic feedback are described. A wearable ring device may include an outer housing, an inner housing, and a set of electrodes positioned at least partially within the inner housing. The set of electrodes may include a first electrode and a second electrode, and a position of the first electrode, a position of the second electrode, or both, may be based on a size of the wearable ring device. The wearable ring device may include circuitry electrically coupled with the set of electrodes and configured to generate a current between the first electrode and the second electrode via an electrical path external to the wearable ring device. The circuitry may be further configured to modulate a frequency of the current, and the frequency may be configured for electric current-based haptic feedback.

WO 2026/169725 A1



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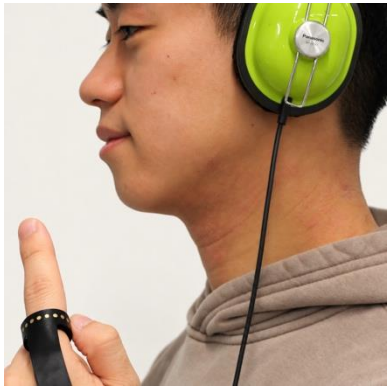
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