NUI

patrick baudisch

MSR faculty summit 2012

HPI Hasso Plattner Institut

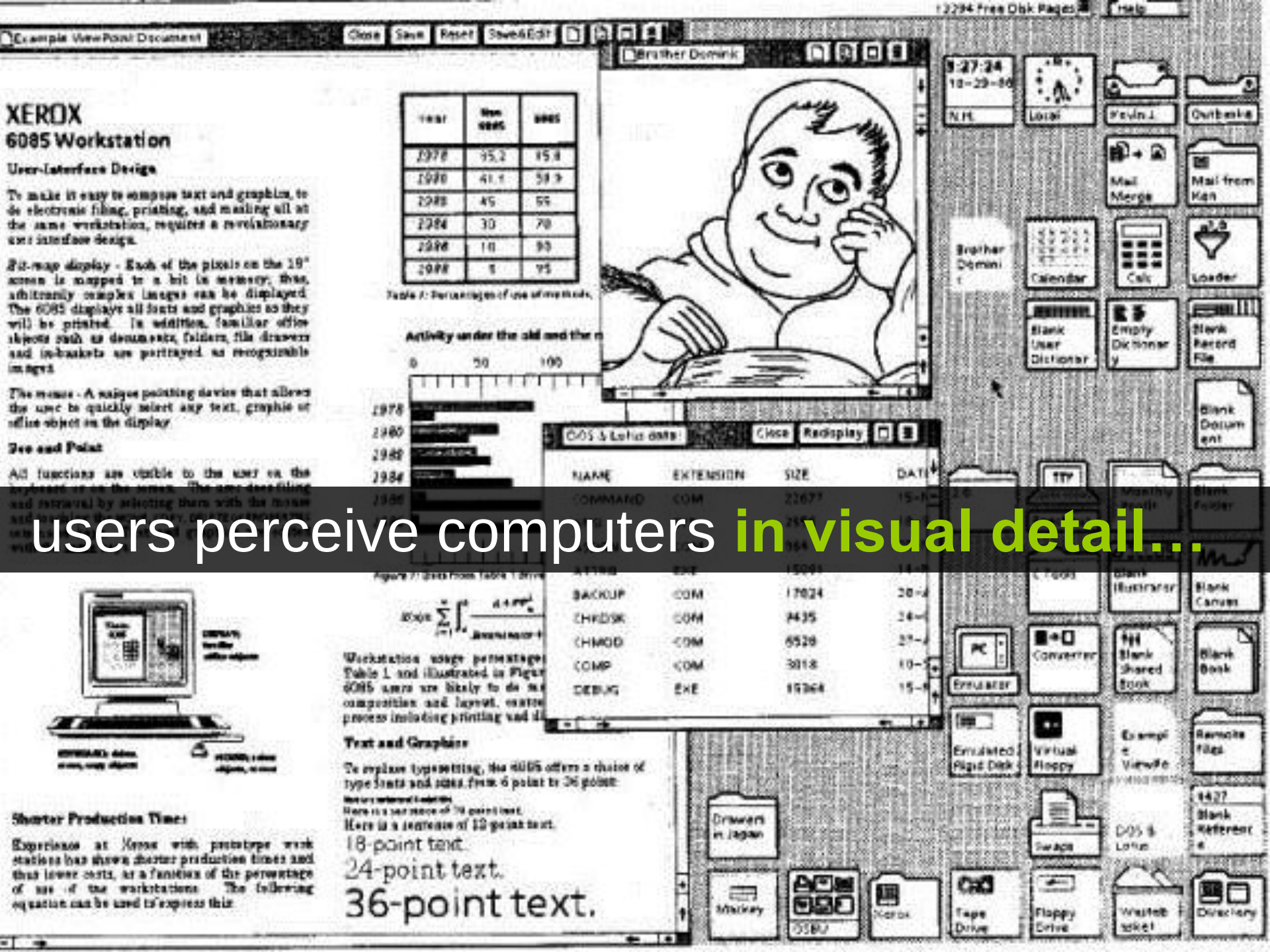
summary:

natural := **unifying** interaction space


and, well, there will be feet

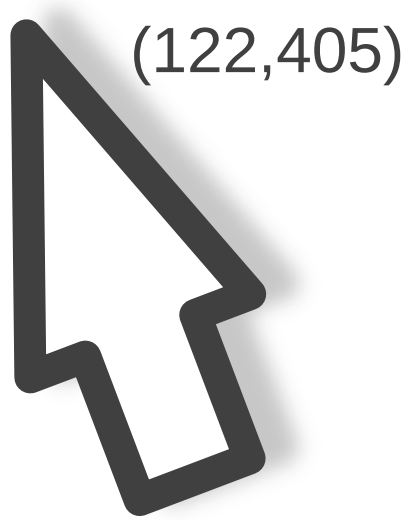
towards NUI

traditional interaction with computers was (and is)
asymmetric…



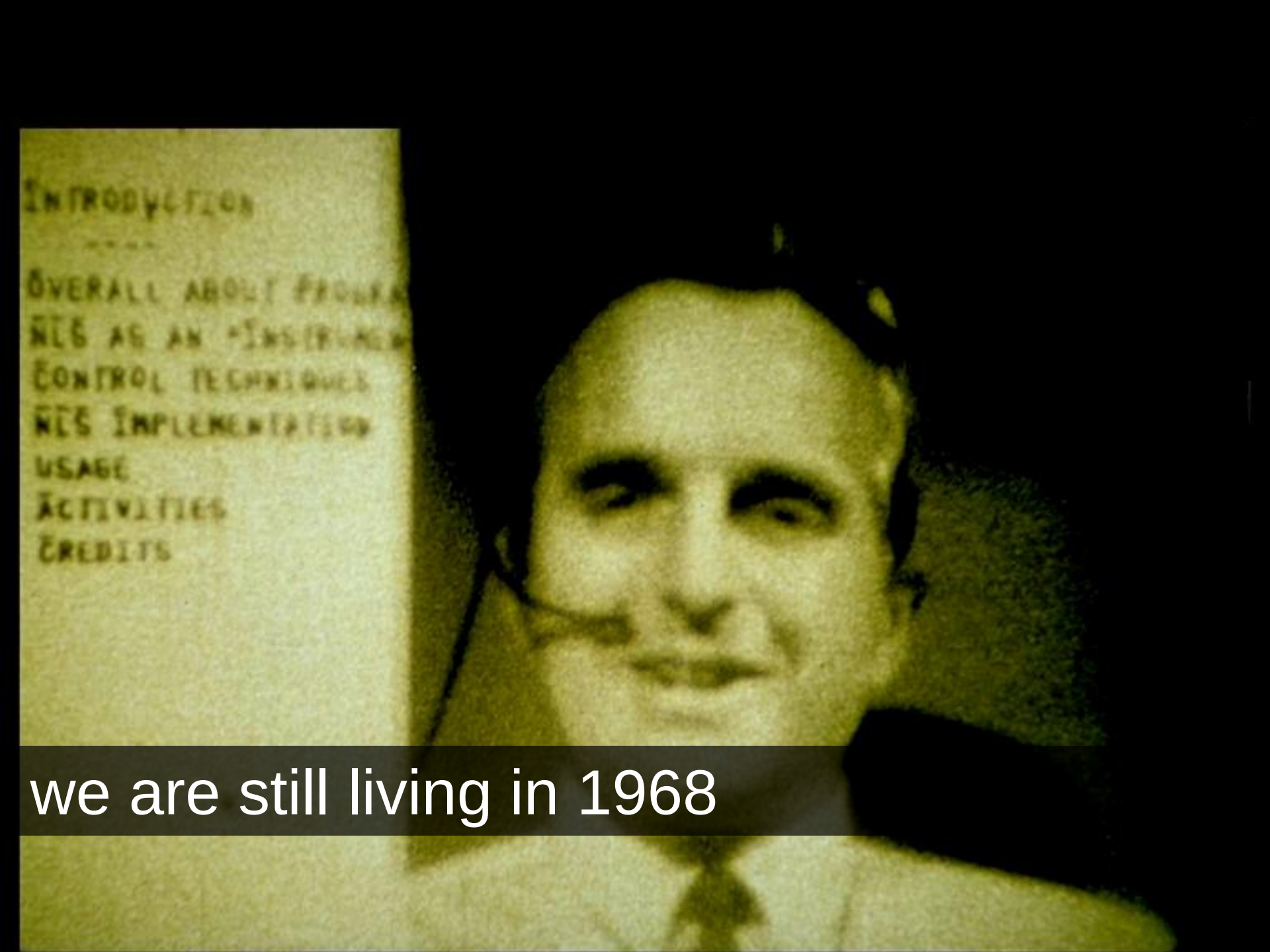
users perceive computers **in visual detail…**

…in contrast, computer perceive users as



user := a **moving crosshair**


we are still living in 1968



we are still living in 1968


we are still living in 1968

but the world is **changing…**

“NUI”

computers start seeing (& hearing) us the same way we see them: **using cameras**

[image: benko wilson]

influences do not come from the office anymore,
but from…

film, animation, & games


this is a >$1.000.000 installation

mass-availability


providing masses with 3D mocap…


..and rich 2D input

so what is ‘natural’ about these?

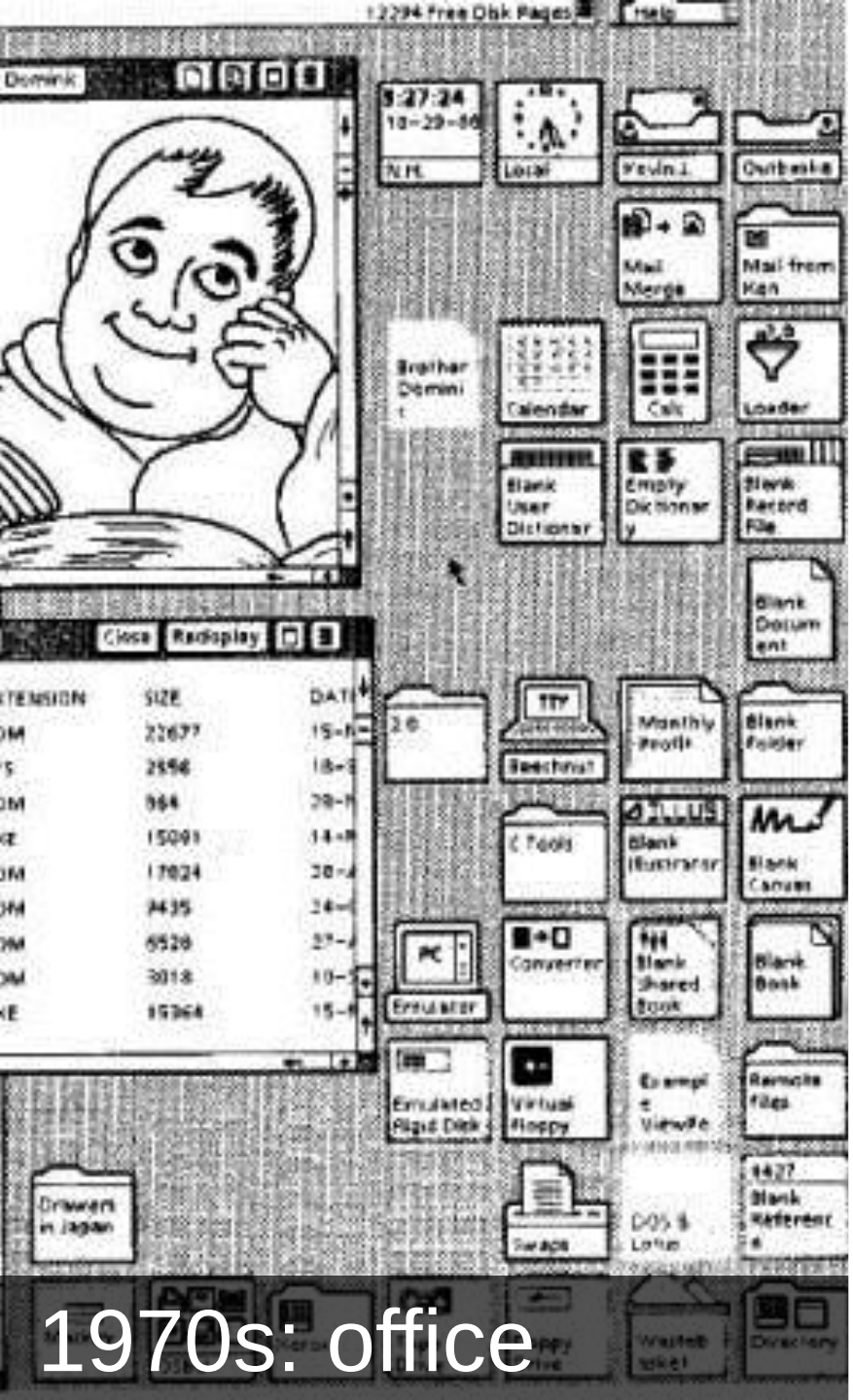
well, **what is natural** in the first place?

(it is also 3D, but that is not what makes it intuitive)

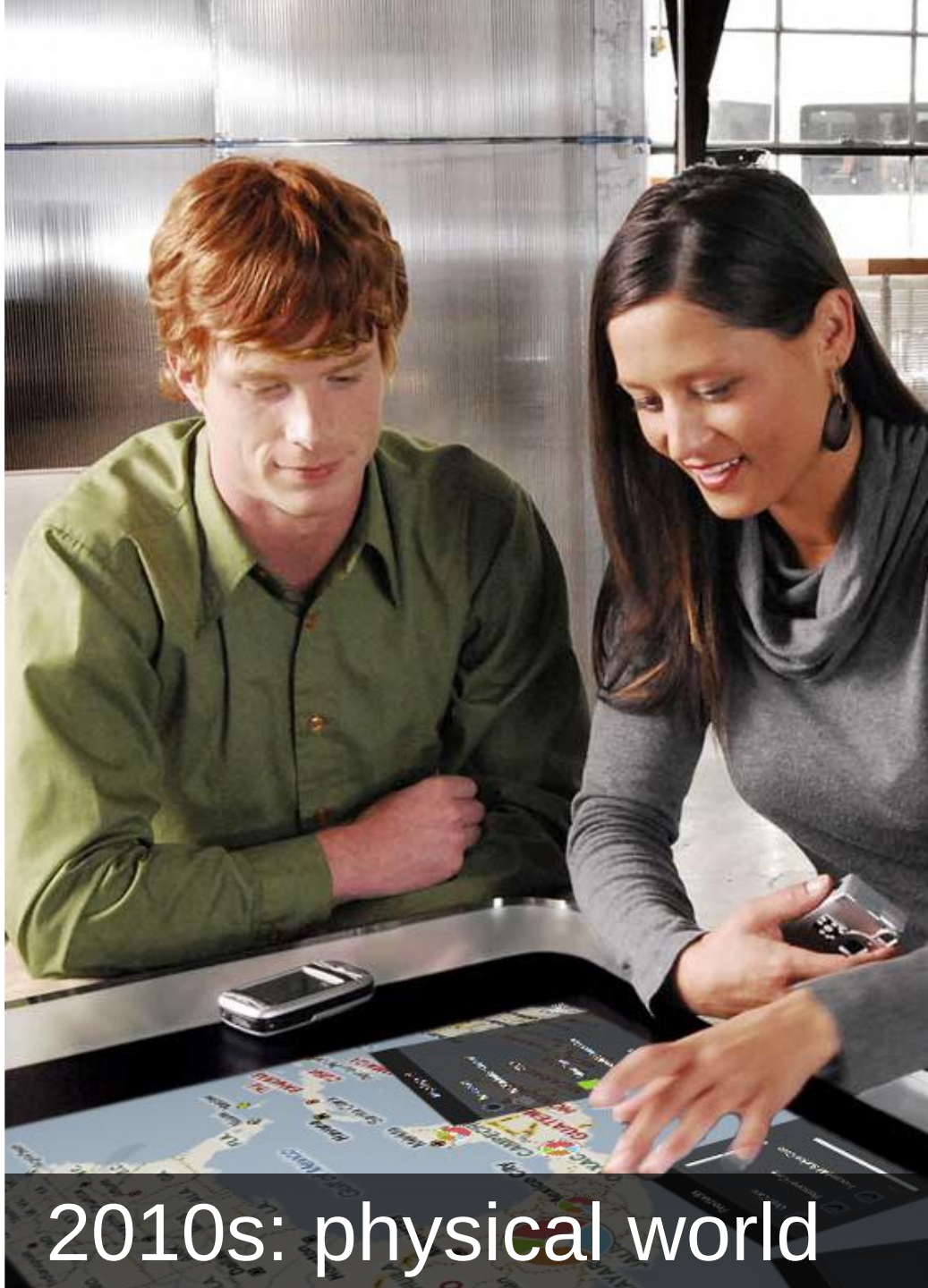
the world around us. **Euclidean space**
→ pointing, ballistics, inertia, spatial memory…

my definition:

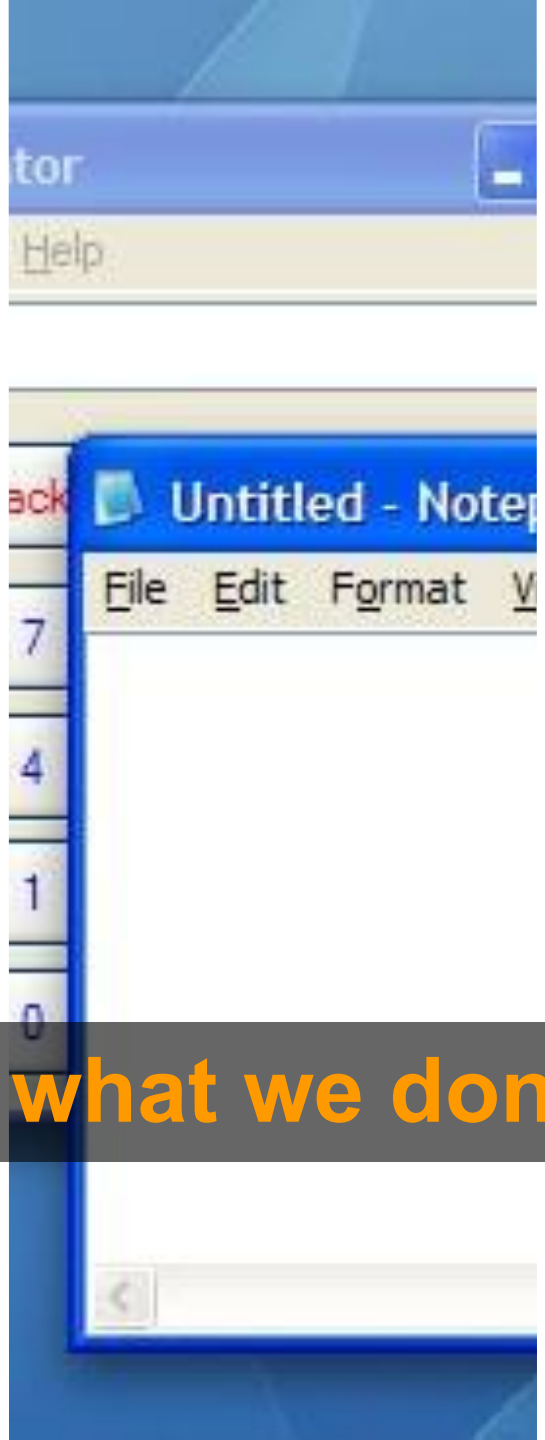
natural UI := a single **Euclidean space**

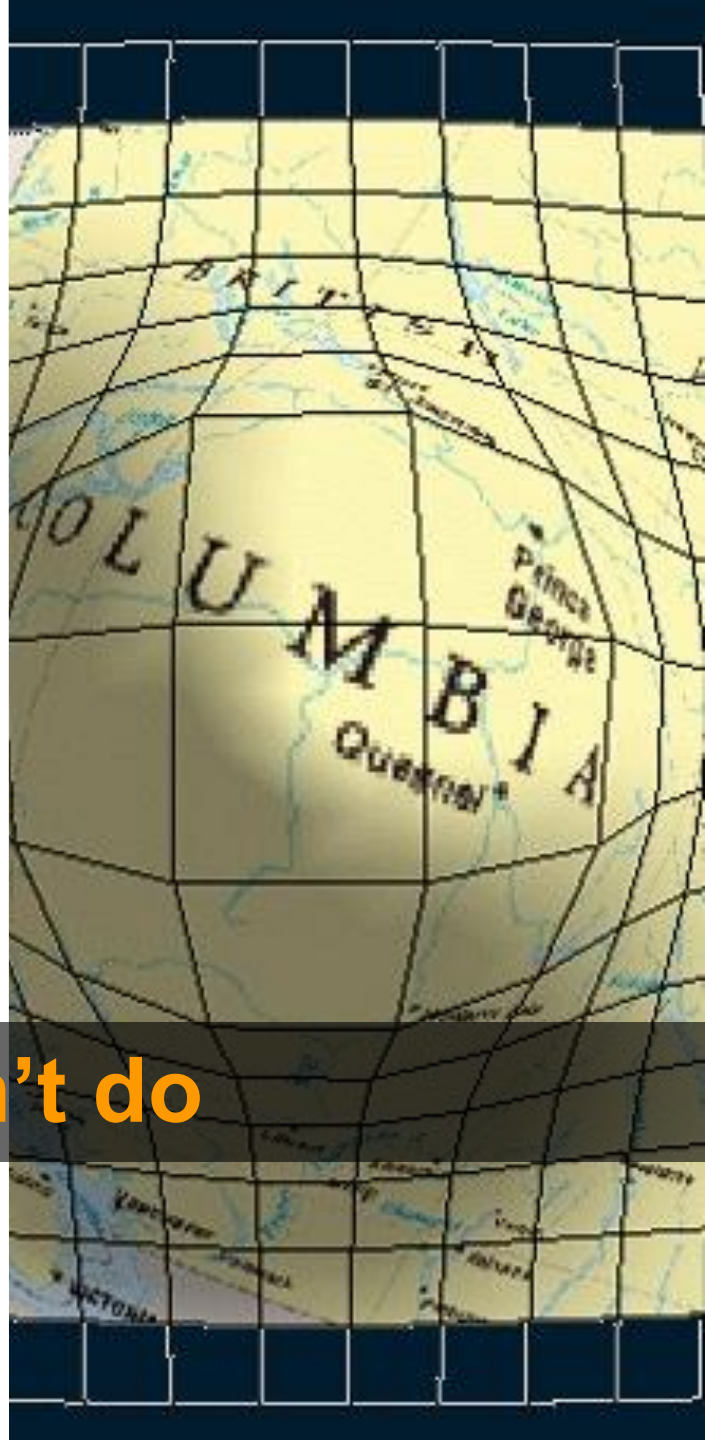


1970s: office



2010s: physical world

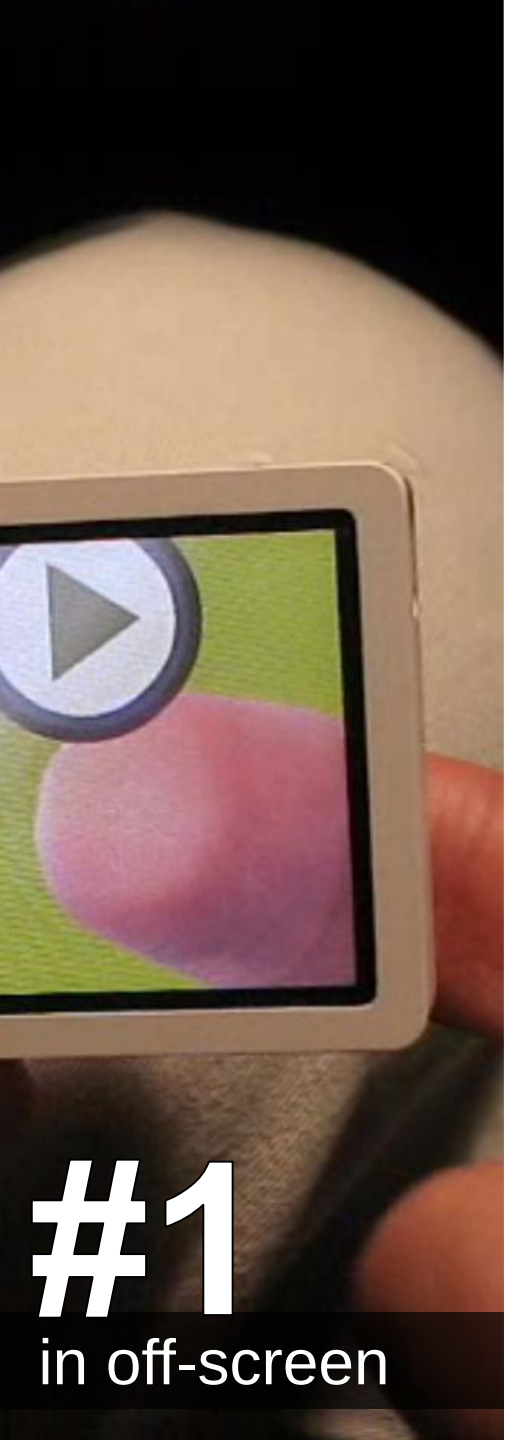




and a lot about **what we don’t do**


how about 3D?
...almost

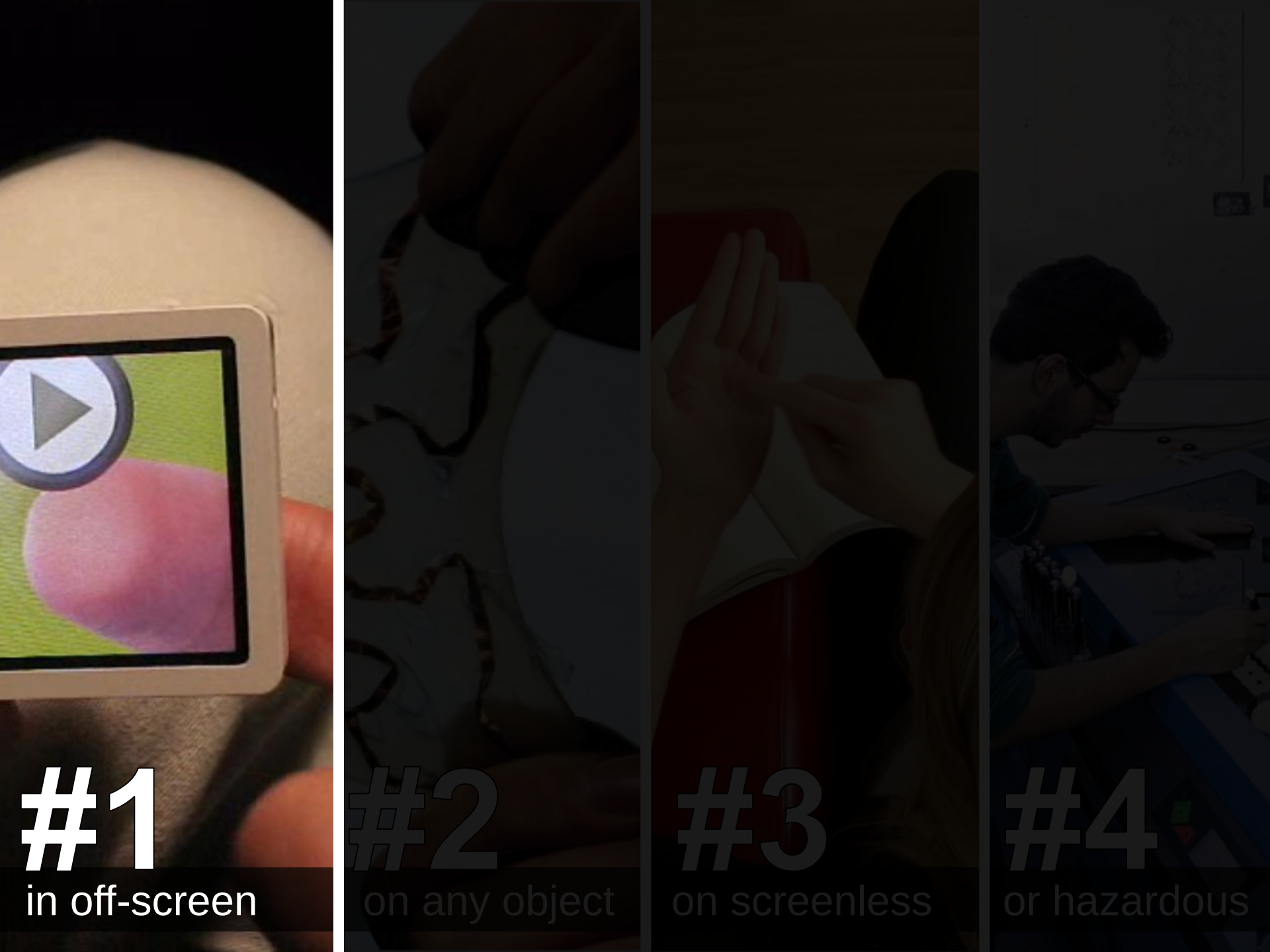
(2D) devices that preserve Euclidean space

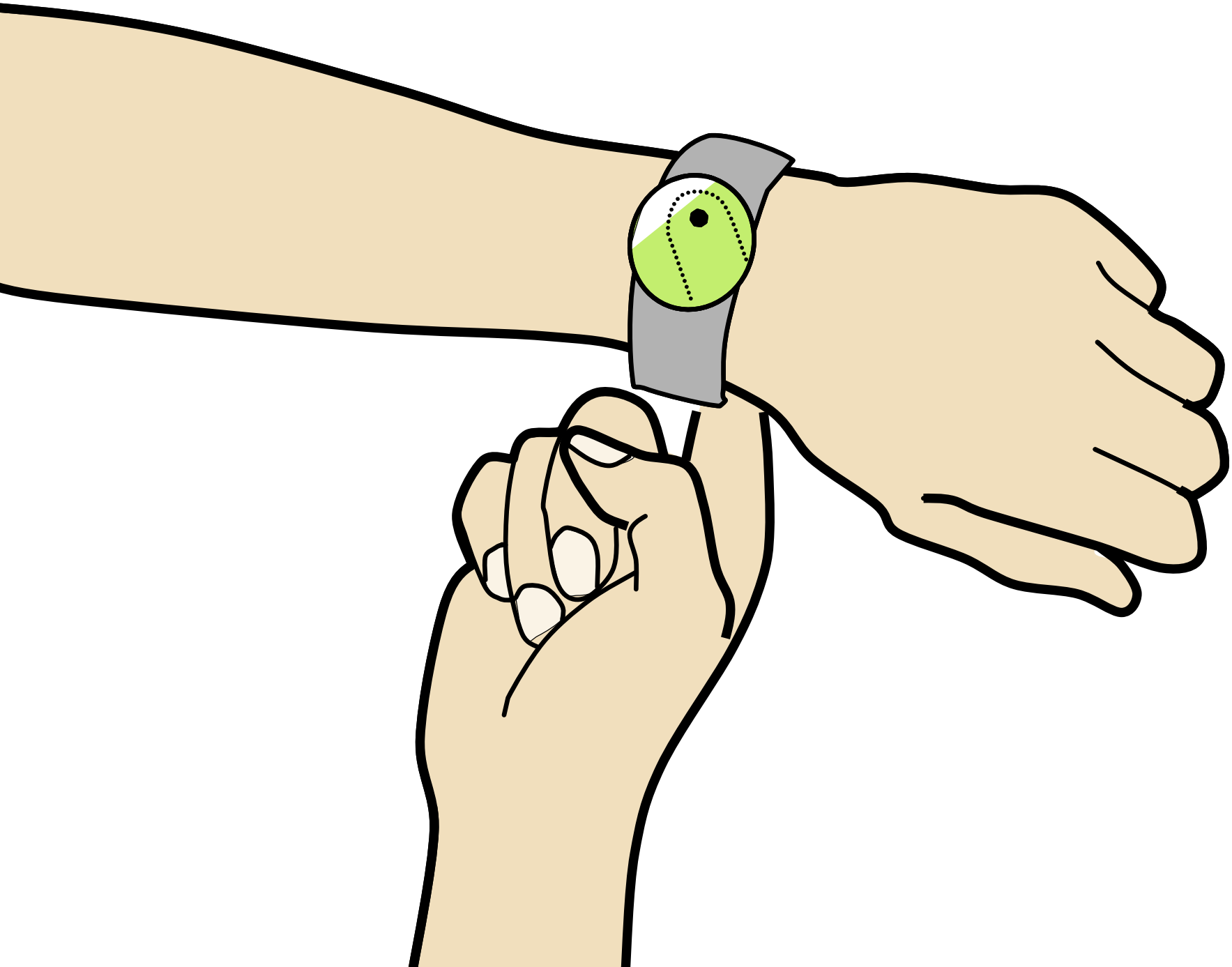

#1
in off-screen

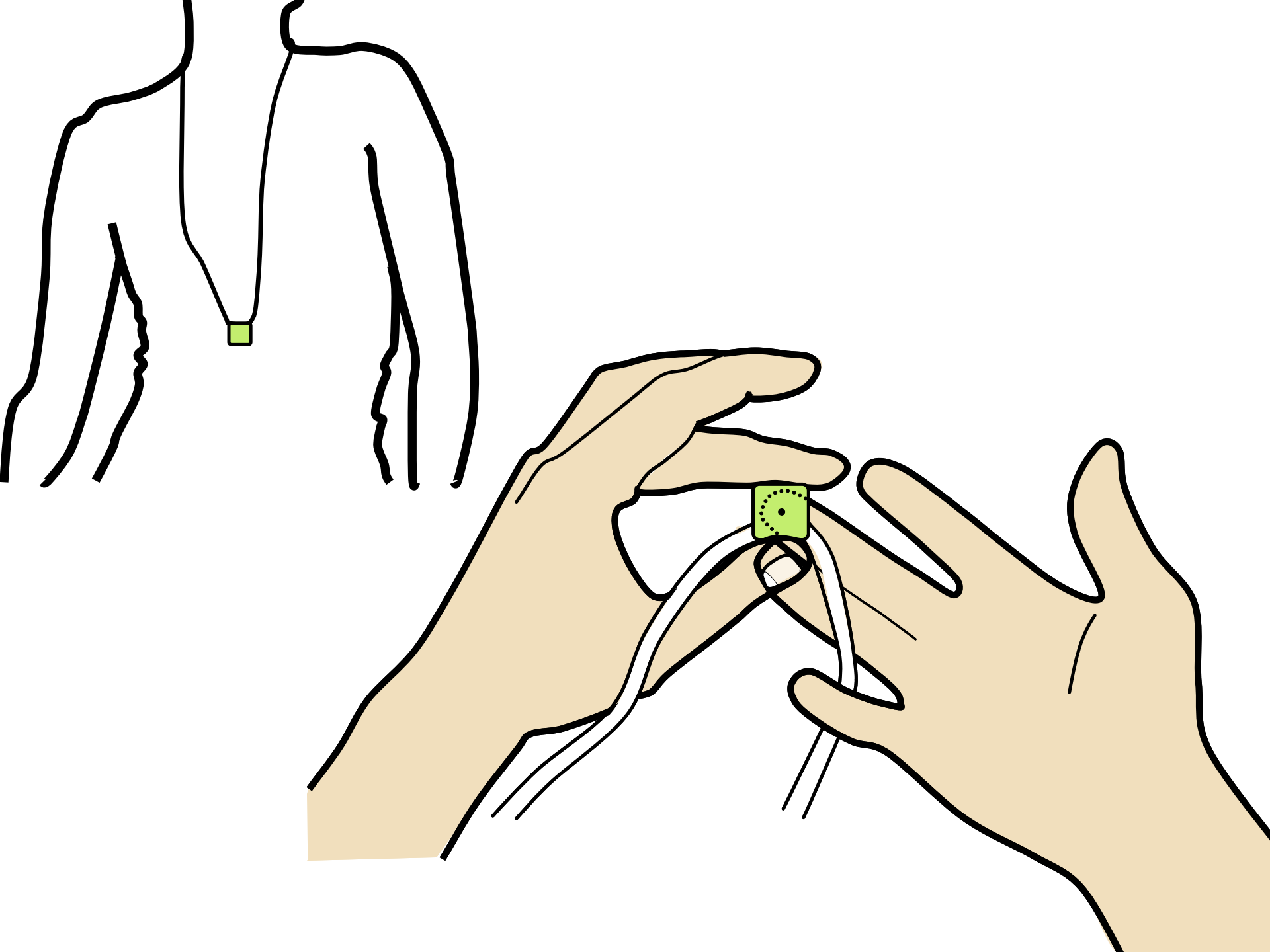

#2
on any object

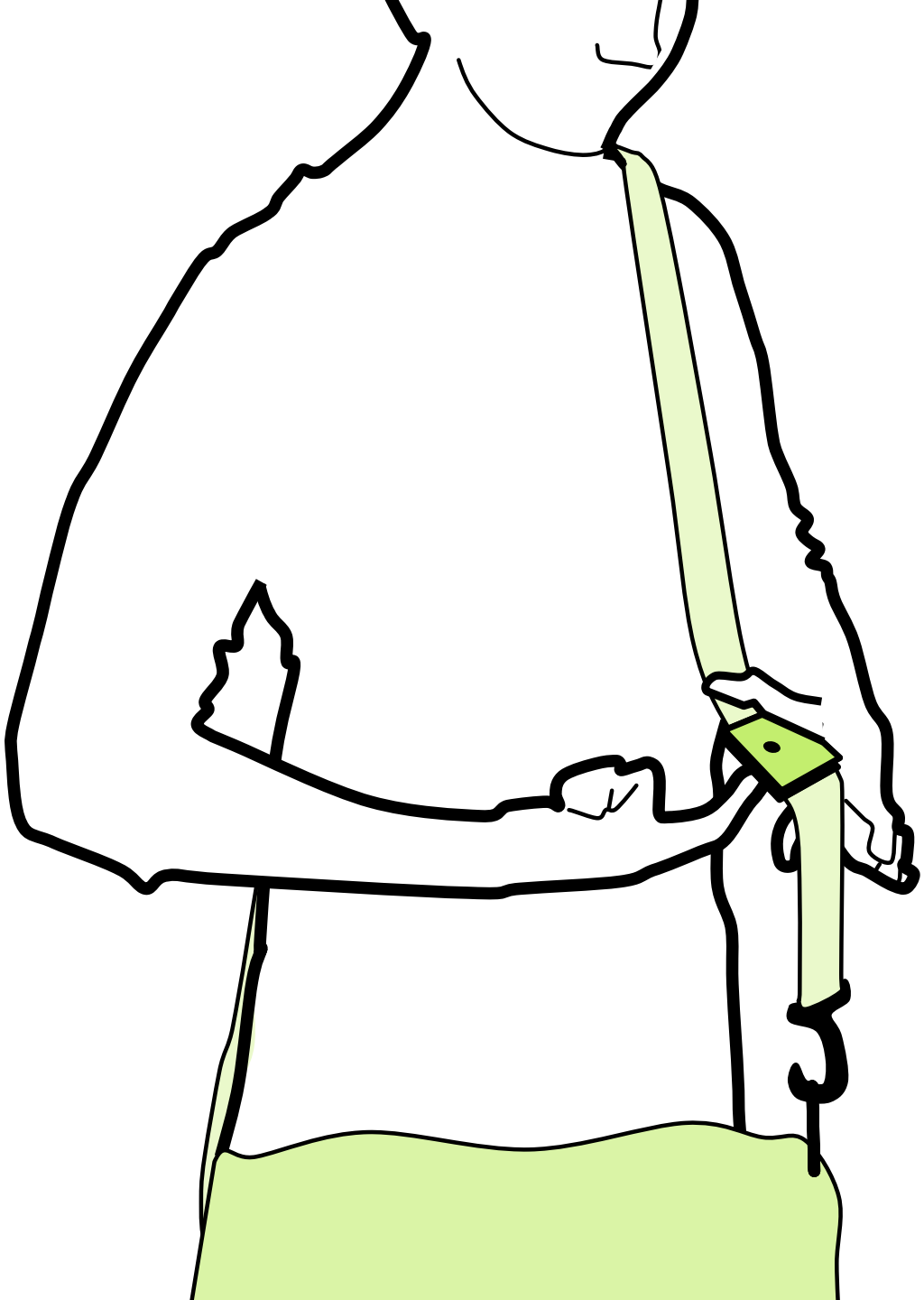

#3
on screenless

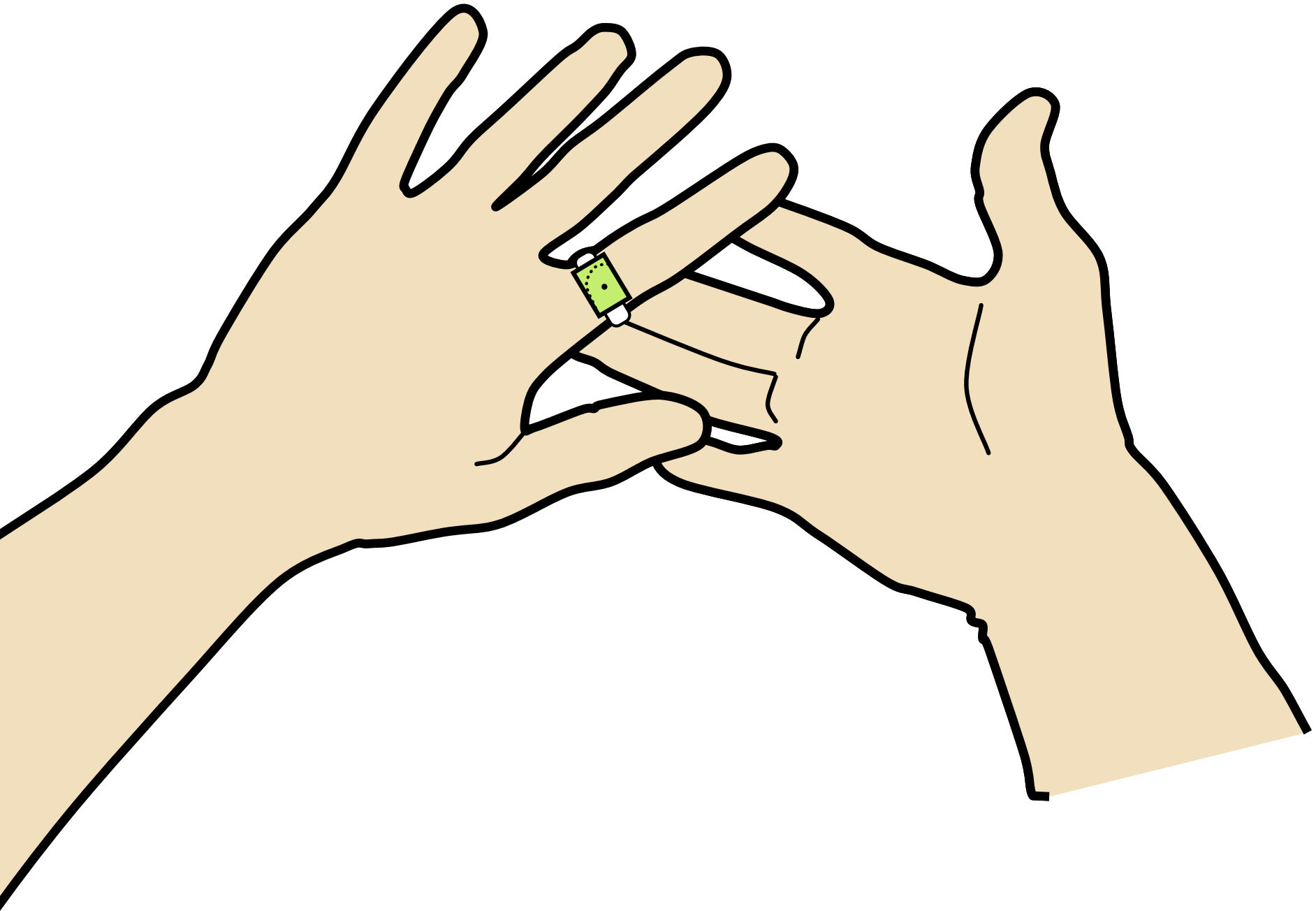

#4
or hazardous

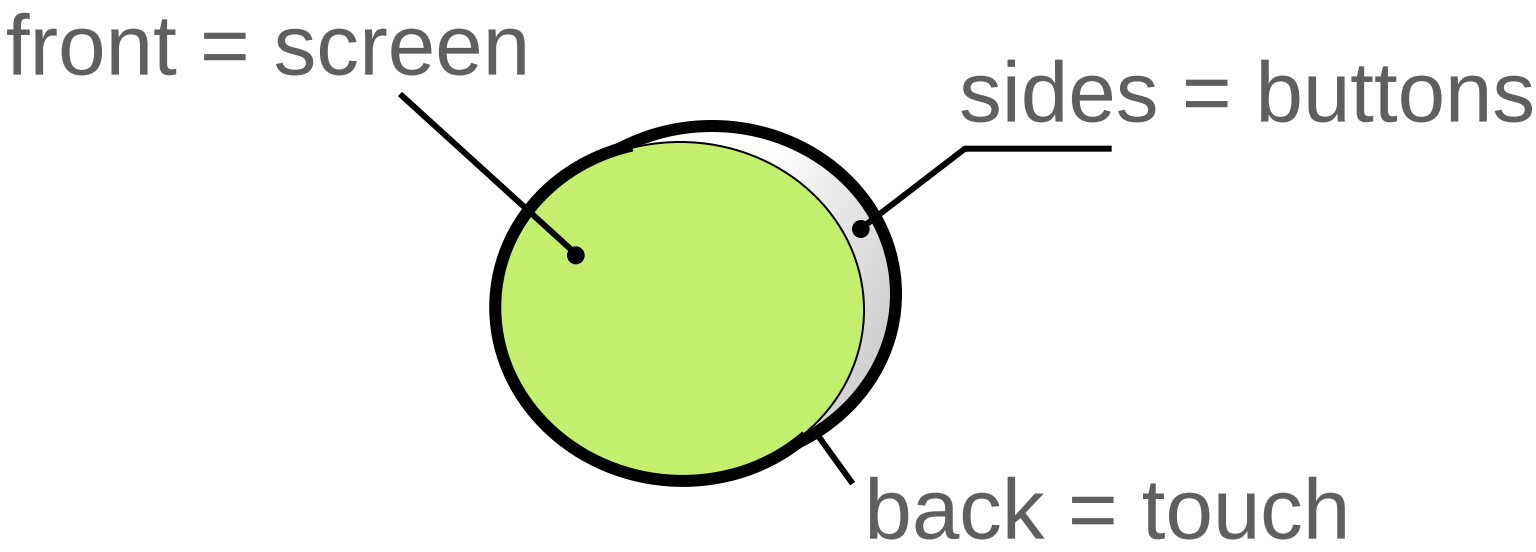

#1
in off-screen
#2
on any object
#3
on screenless
#4
or hazardous

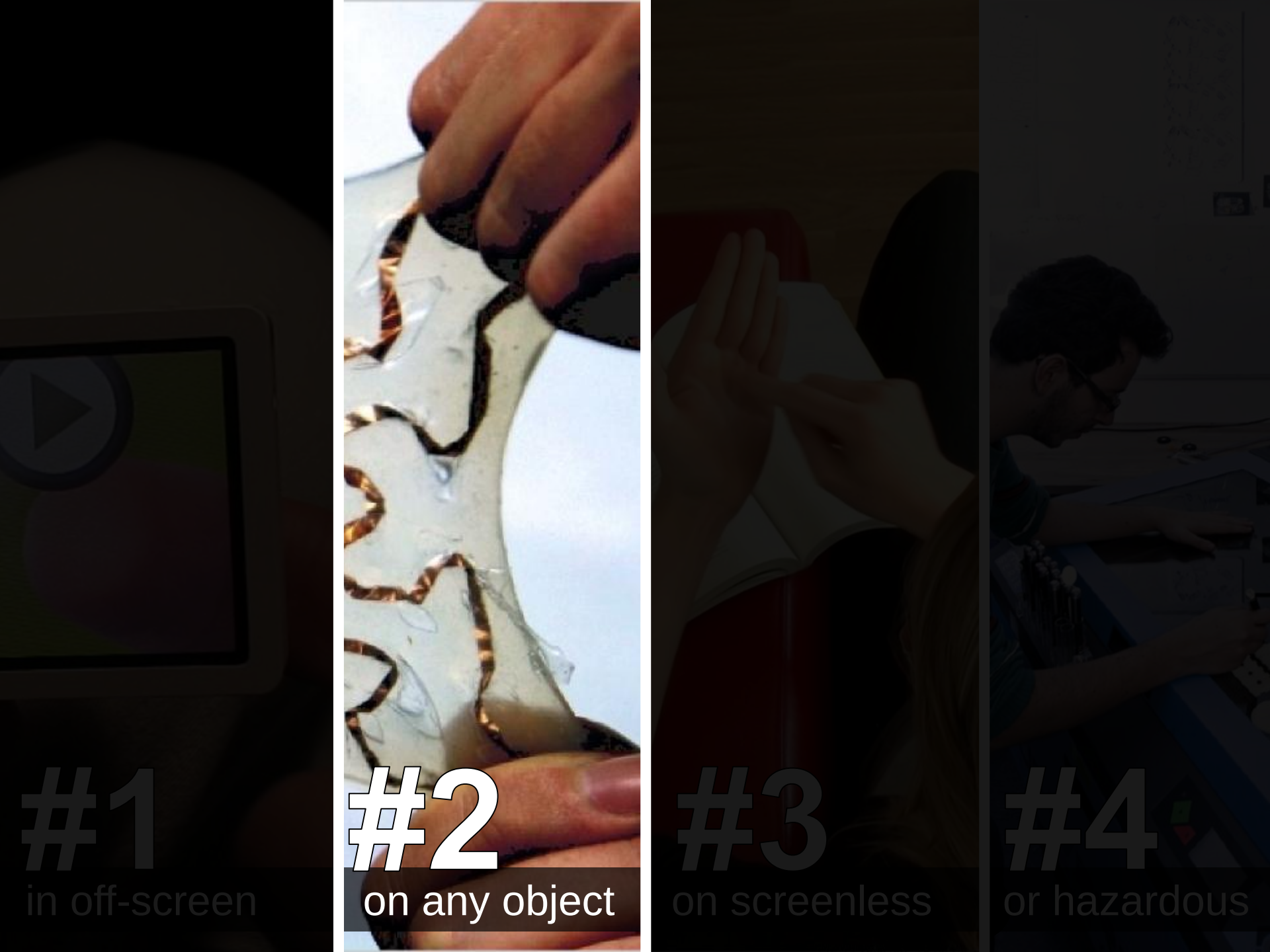


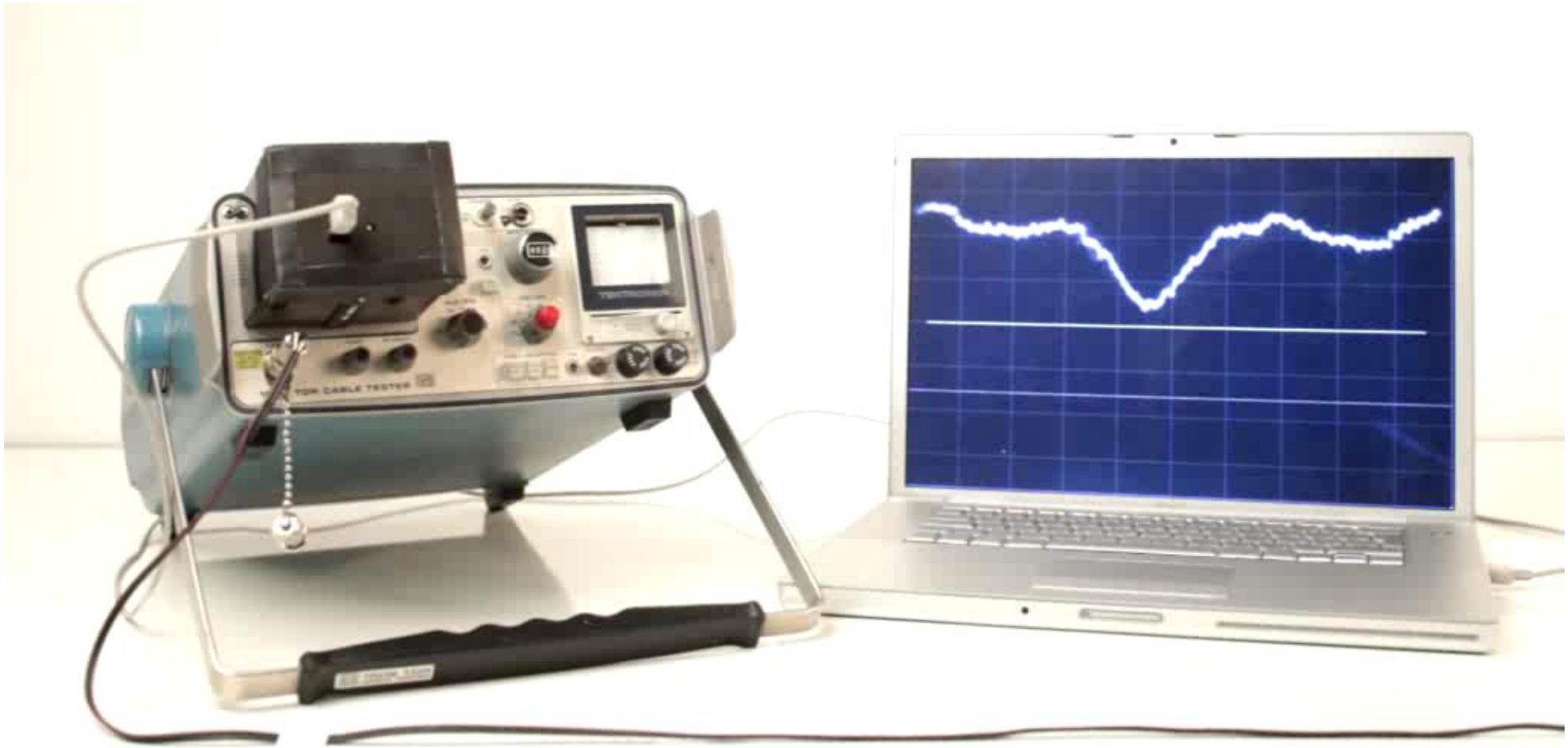


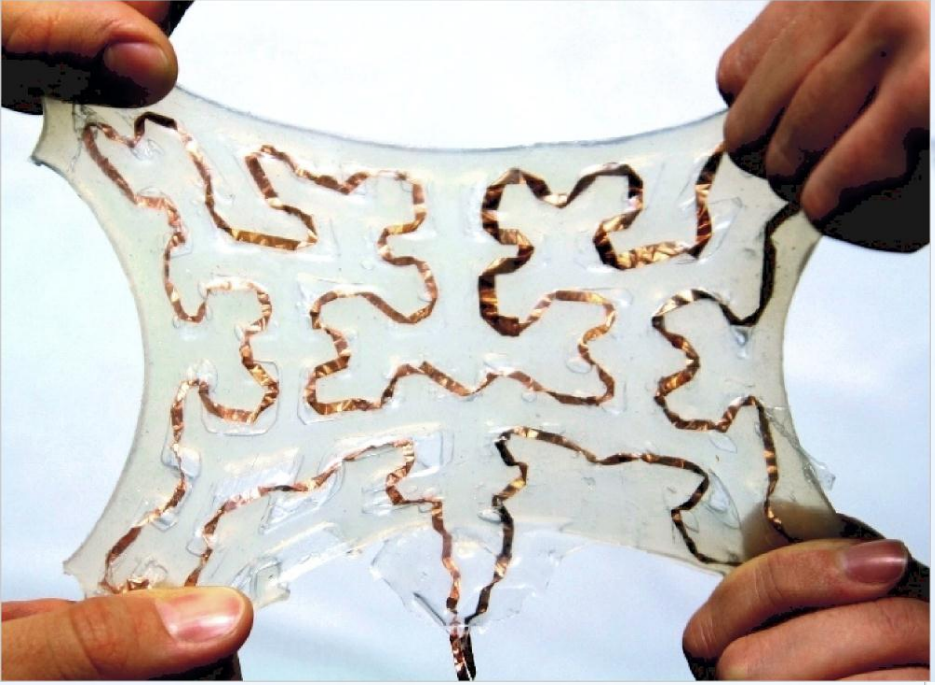


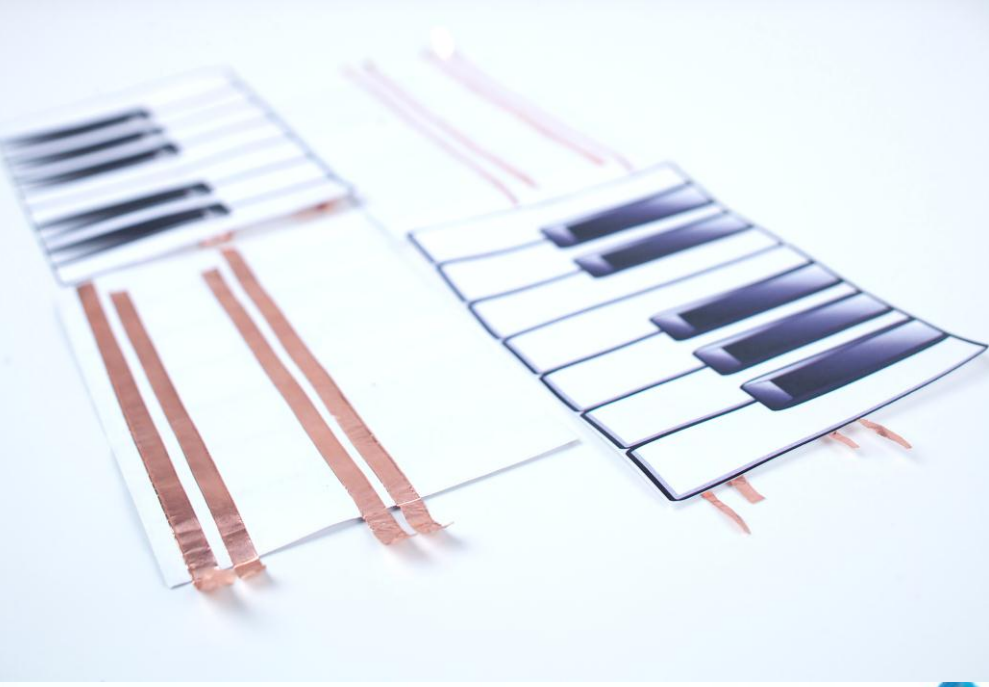


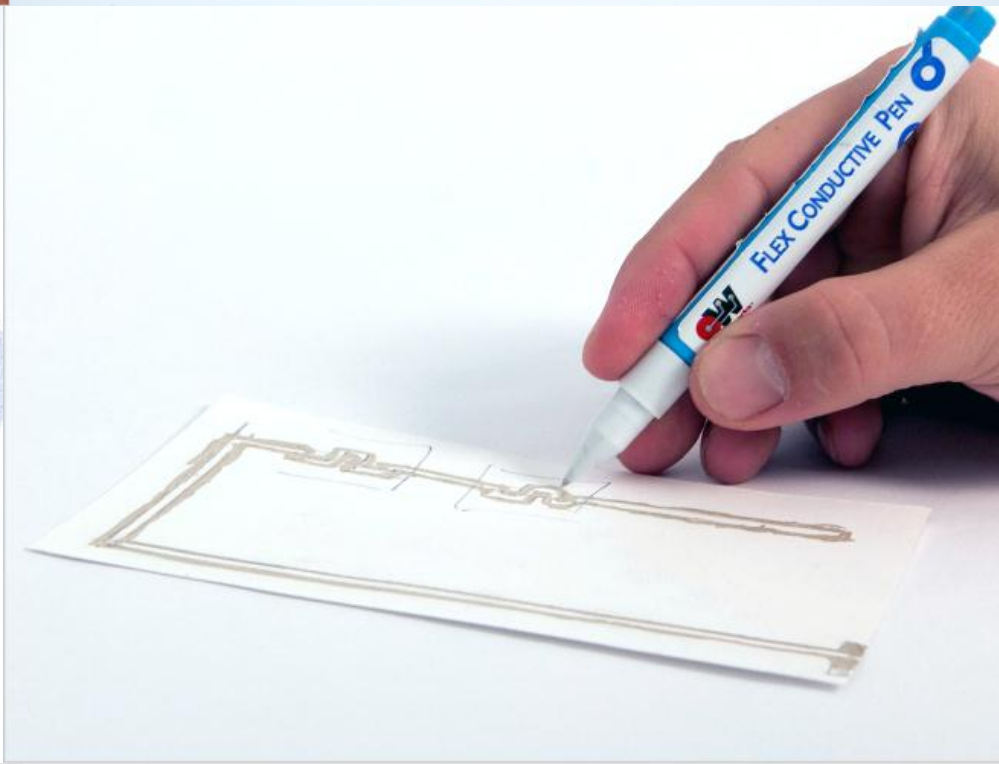

front = screen
sides = buttons
back = touch


#1
in off-screen
#2
on any object
#3
on screenless
#4
or hazardous

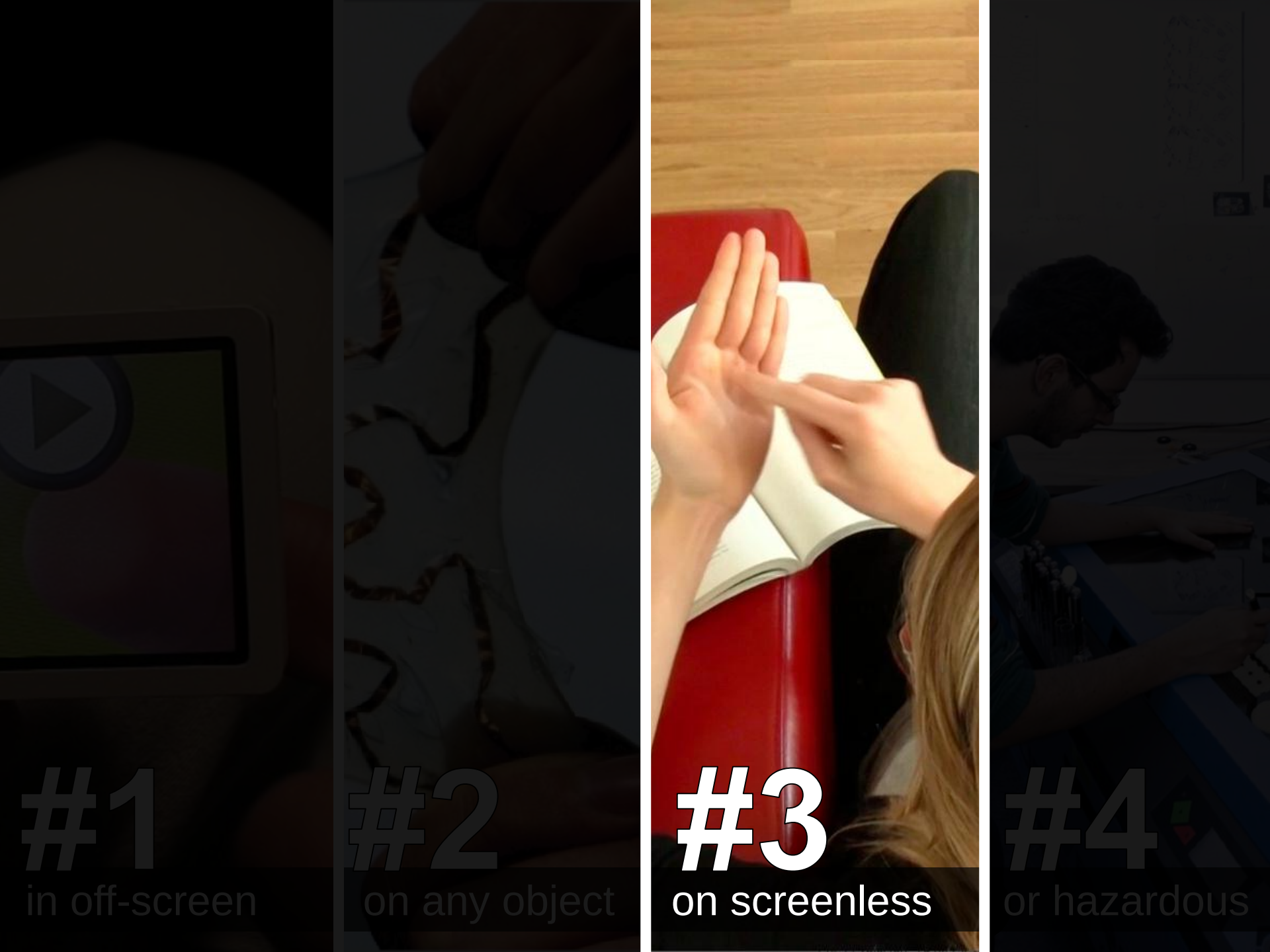




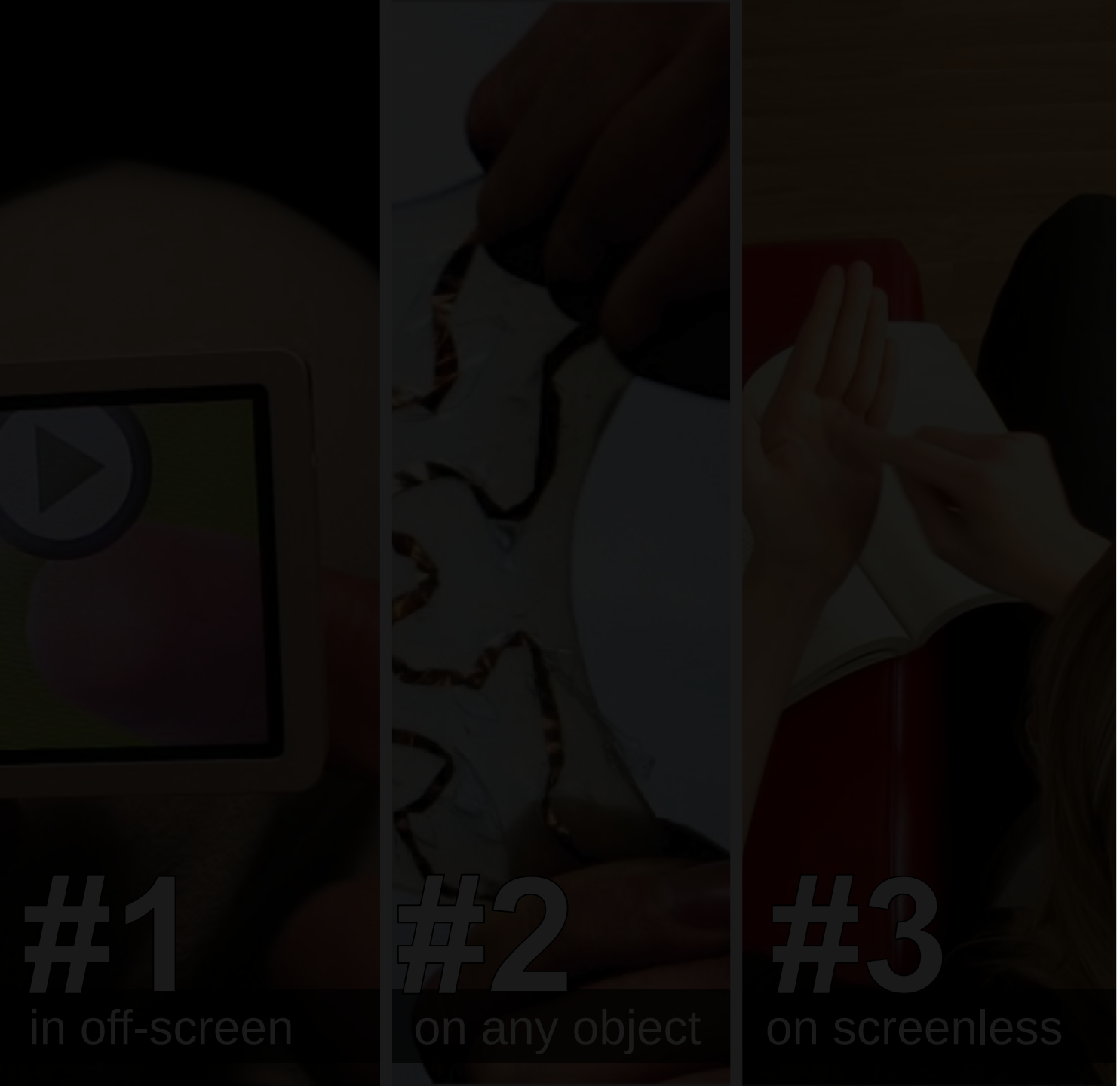



FLEX CONDUCTIVE PEN


LMU
HPI

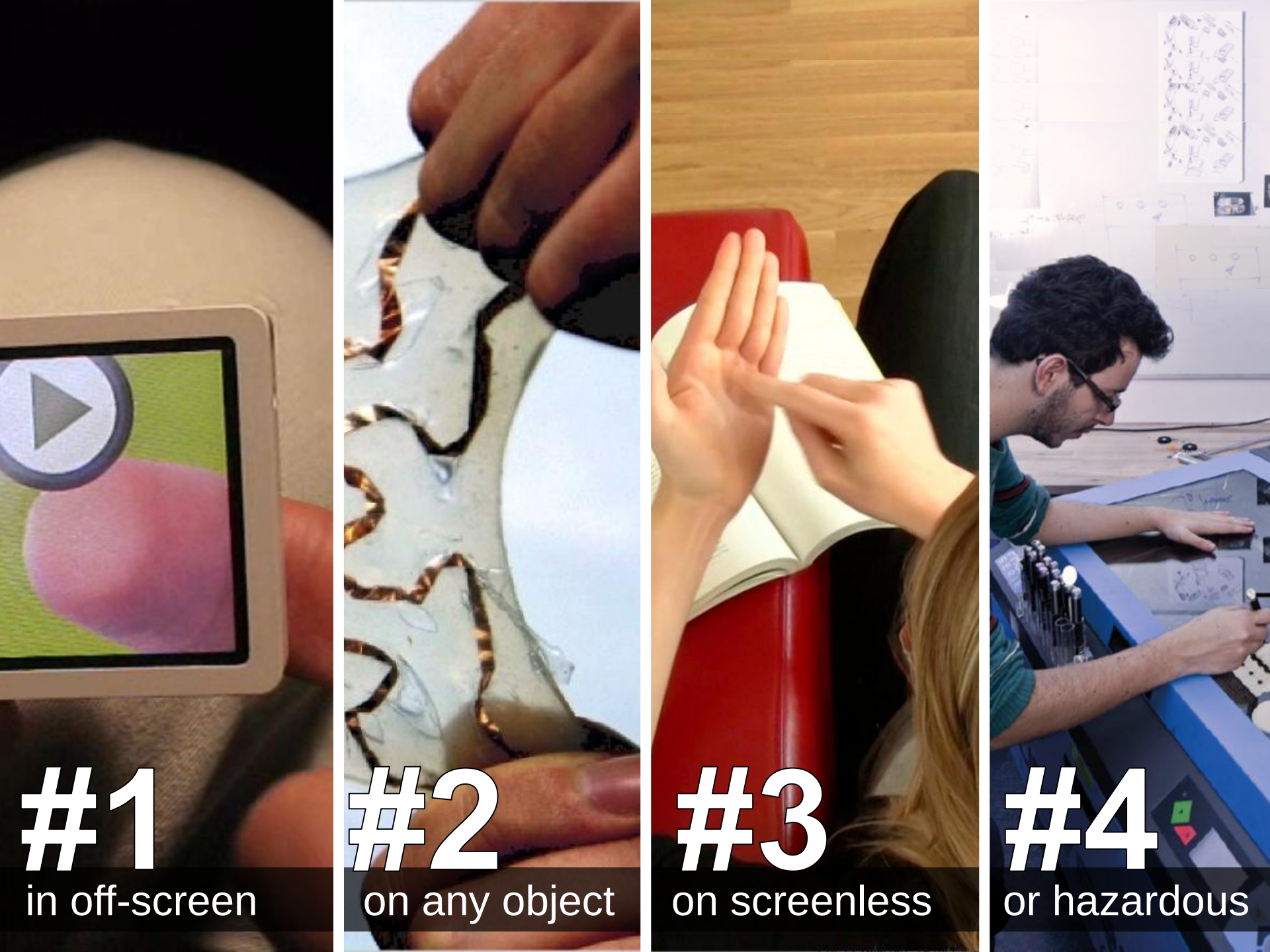

#1
in off-screen
#2
on any object
#3
on screenless
#4
or hazardous


HPI
Imaginary Phone


#1
in off-screen
#2
on any object
#3
on screenless


#4
or hazardous

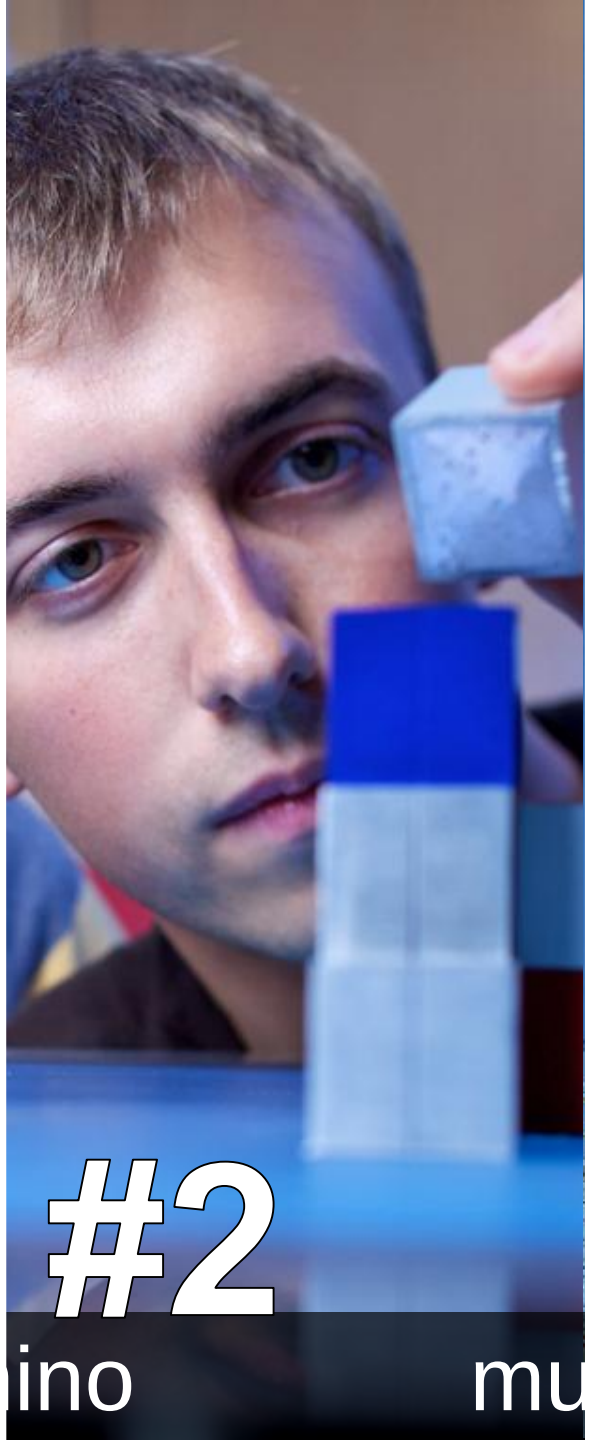

HPI
constructable
interactive lasercutting


#1
in off-screen
#2
on any object
#3
on screenless
#4
or hazardous

we understand Euclidean interfaces well in 2D.
how can we **apply what we learned to 3D?**

#1

ridgepad

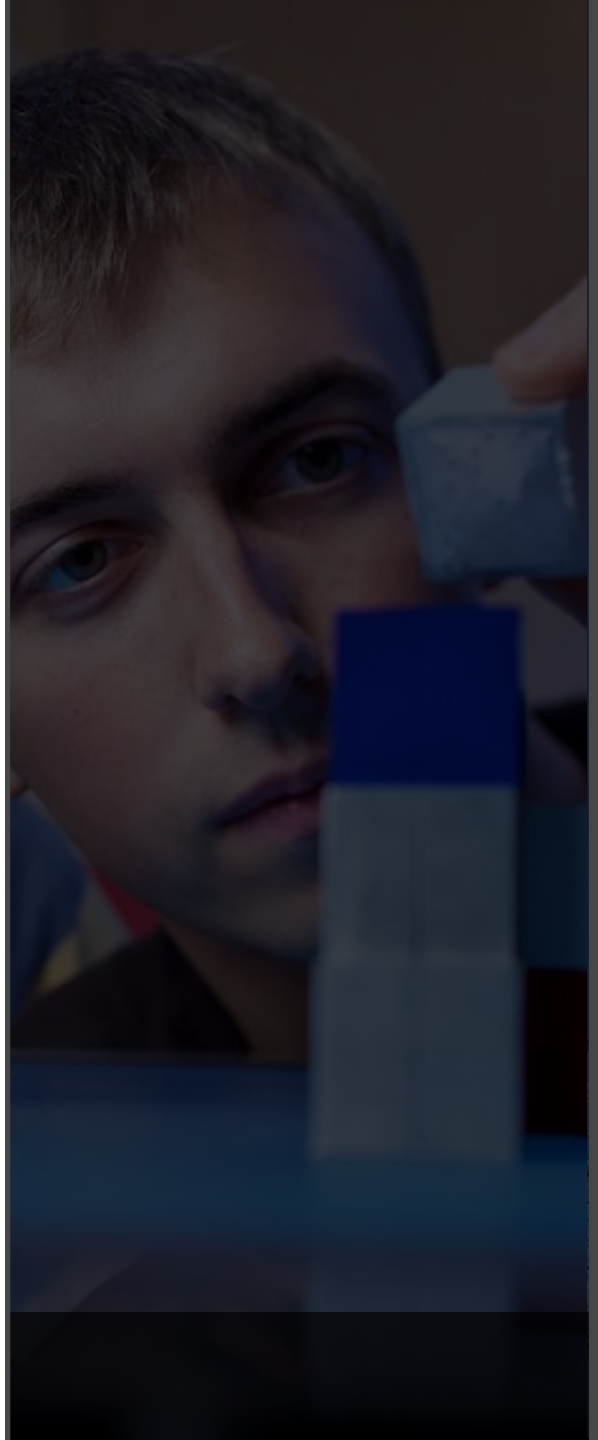
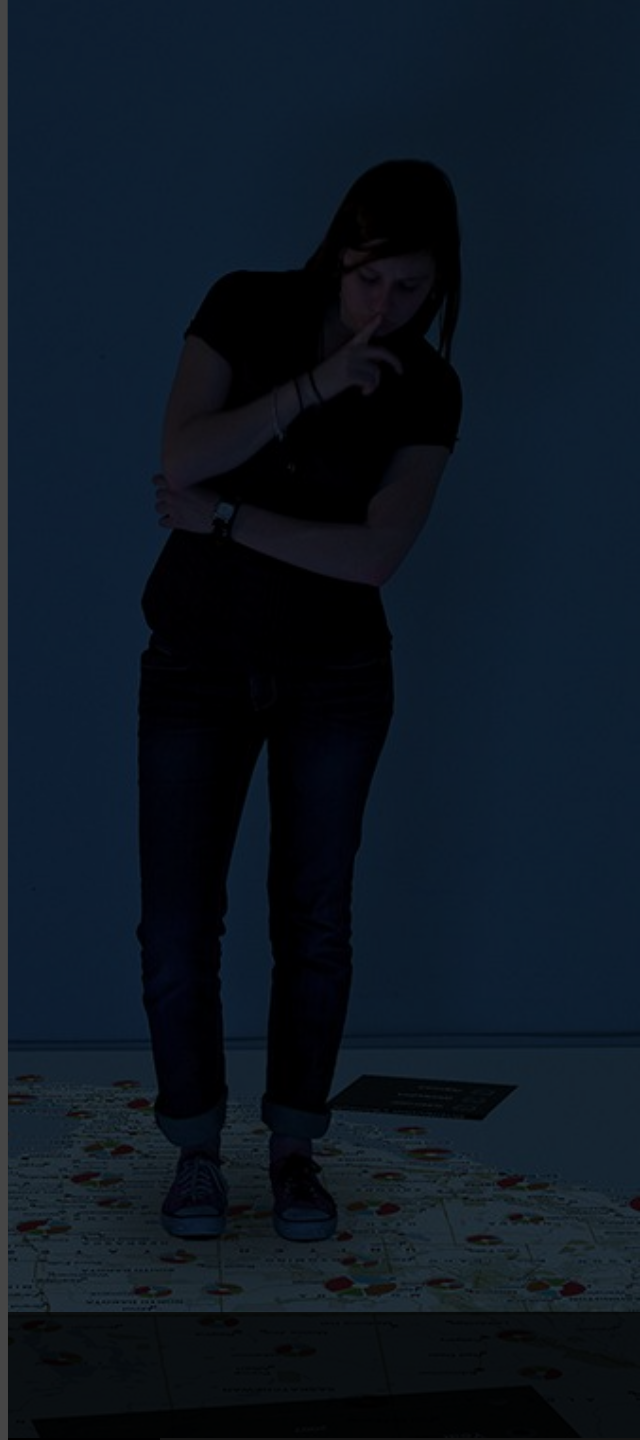


#2

lumino

#3

multitoe

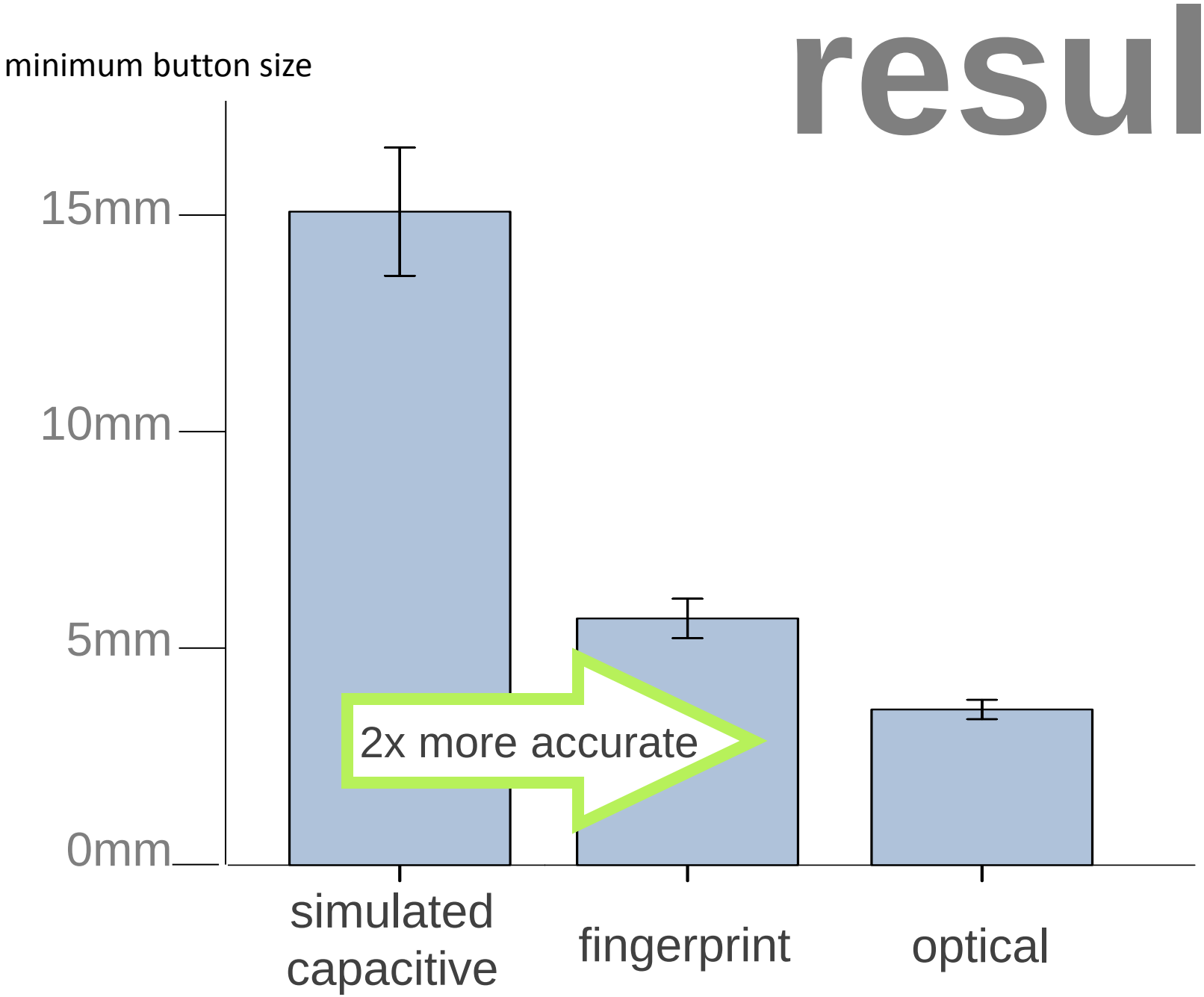

#1
ridgepad



super precise touch input

gets everything a traditional touchpad gets
but also **participantID and roll, pitch, and yaw**

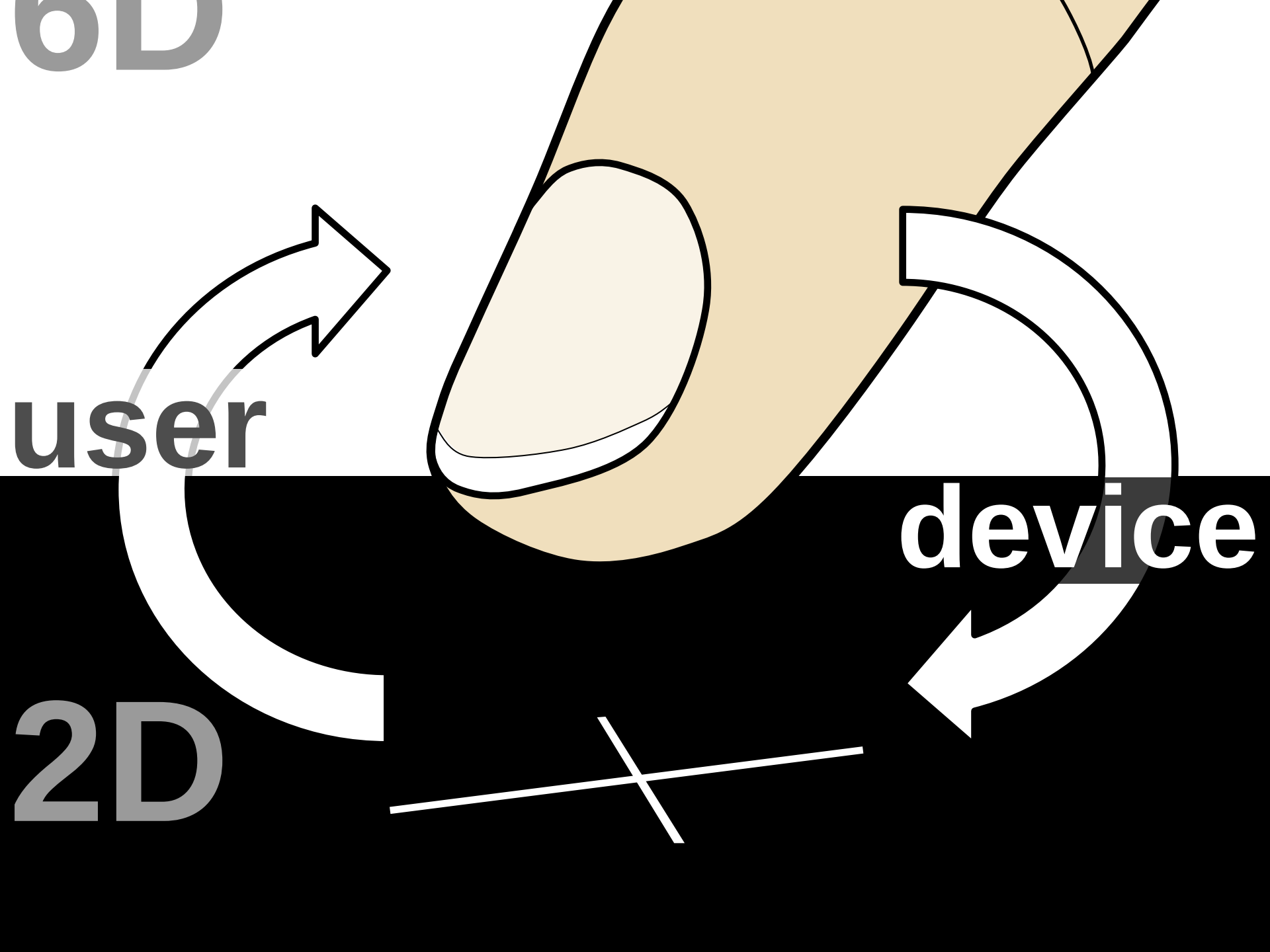

GUARDIAN

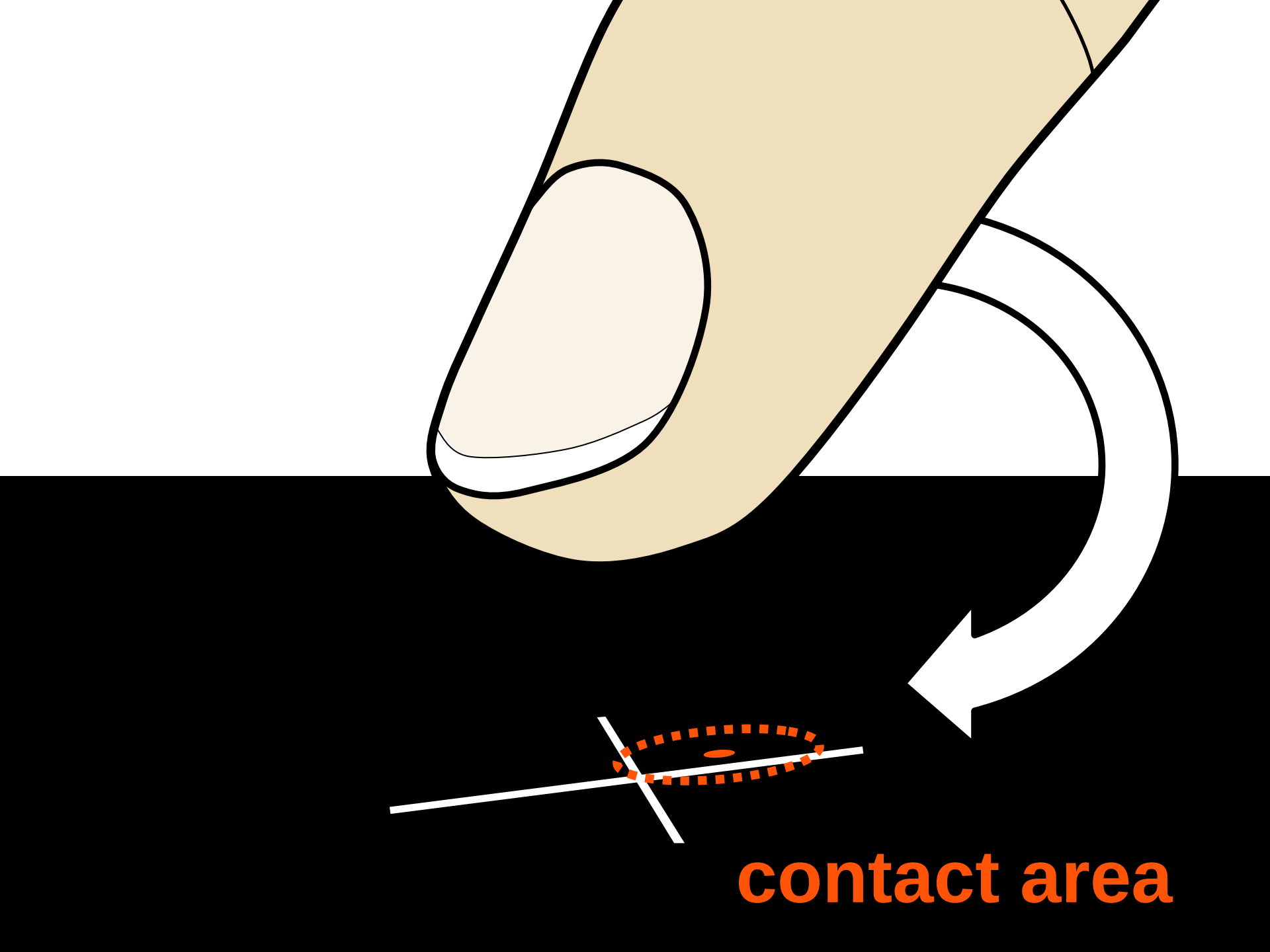
results

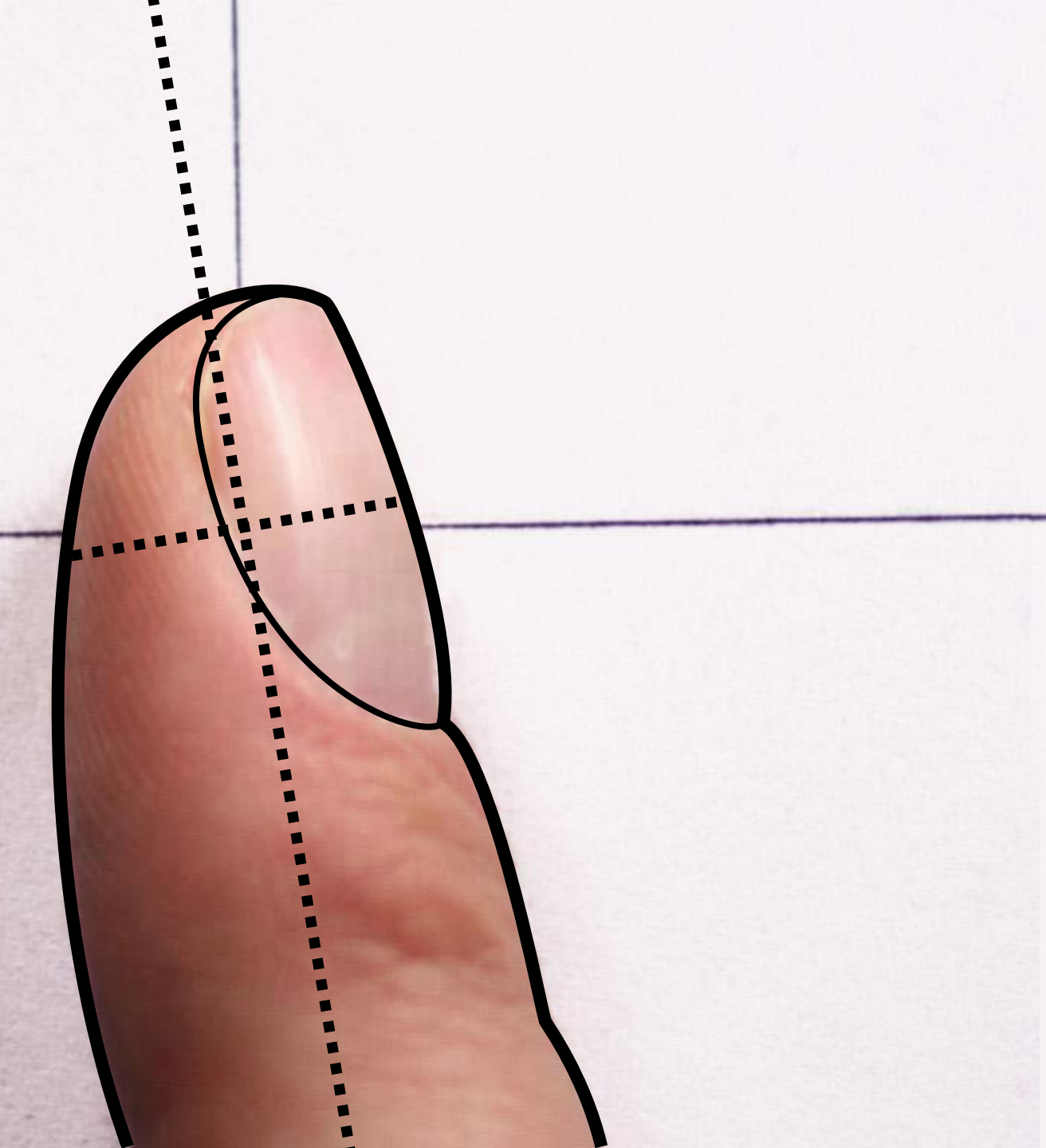


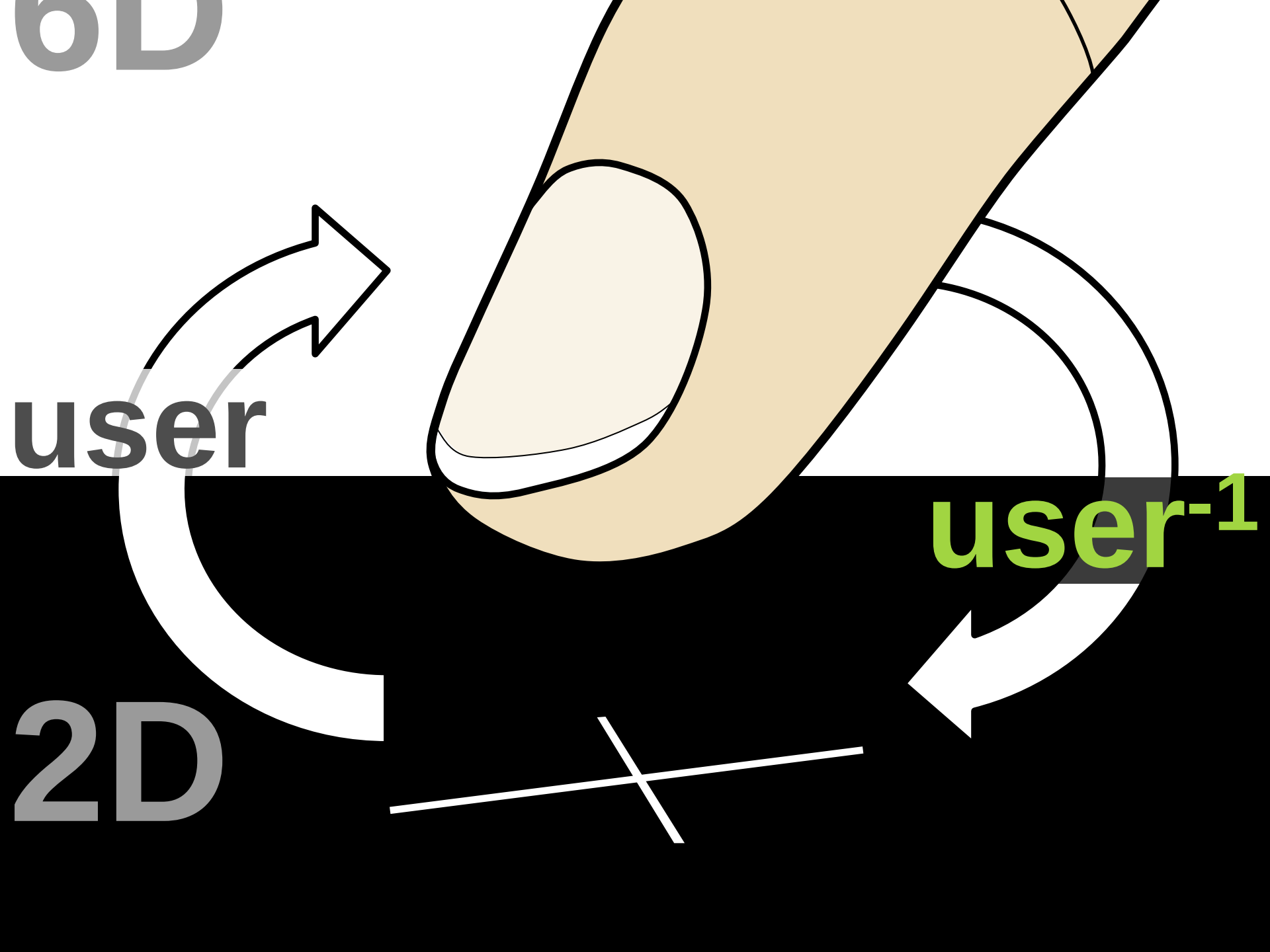
error bars are standard deviation

the effect, it turns out comes from
a twist in Euclidean space


6D
user
device
2D


contact area




6D
user
user-1
2D

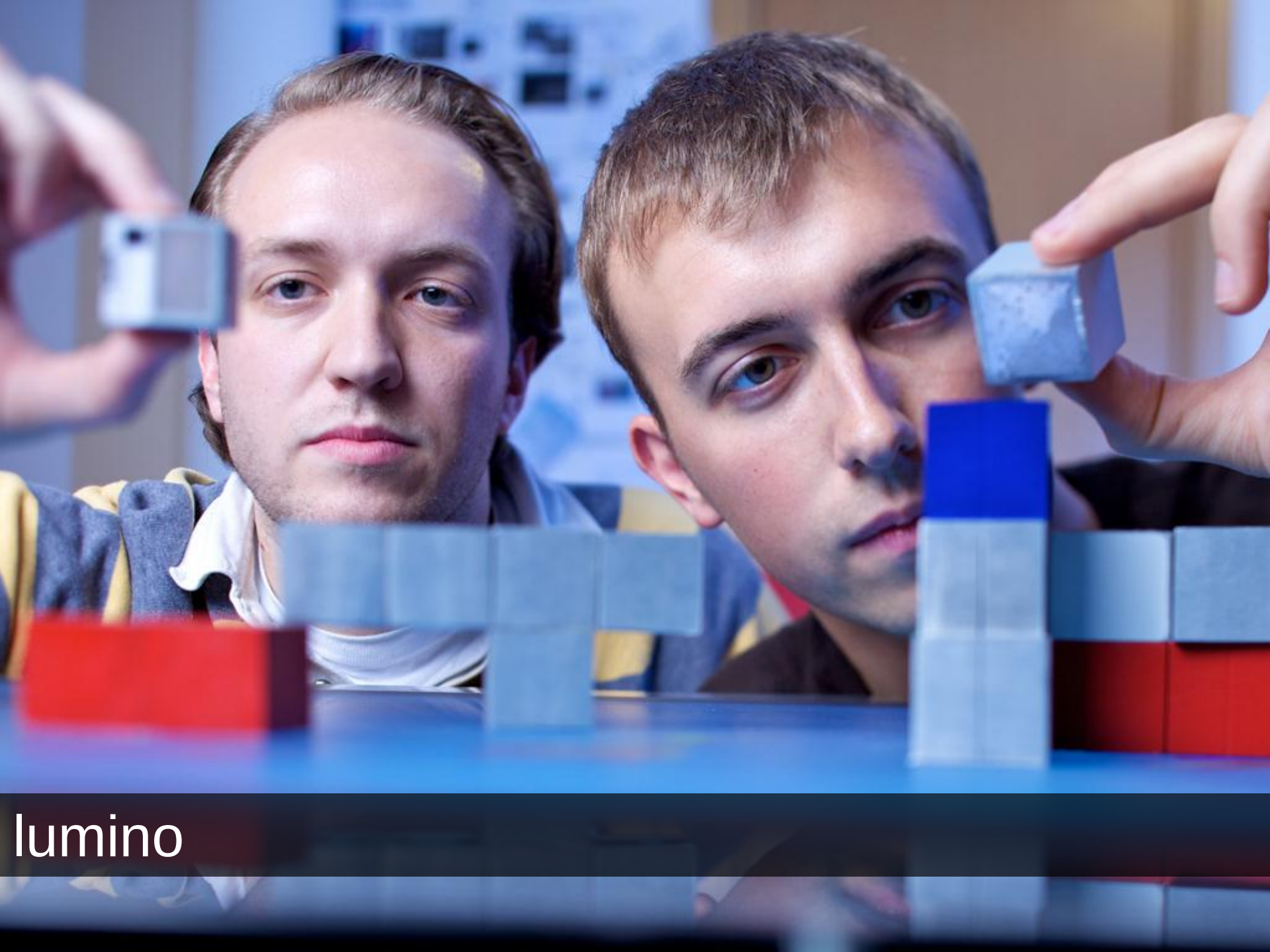
when we were done,
ridgepad had left us with **an idea:**

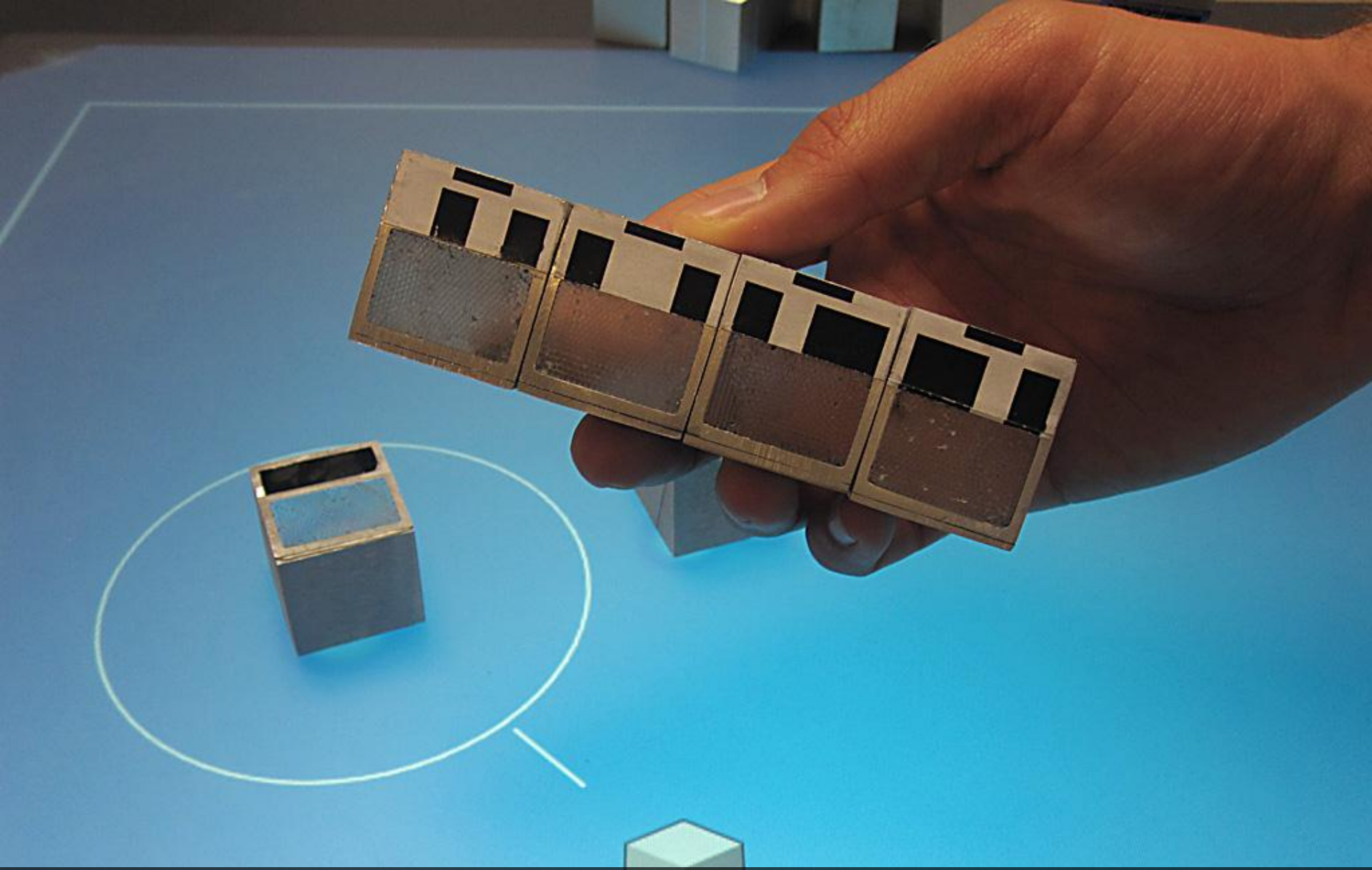
by observing a 2D contact area

1. we can **recognize objects** (→fingerprint)
2. we can also **reconstruct 3D pose**

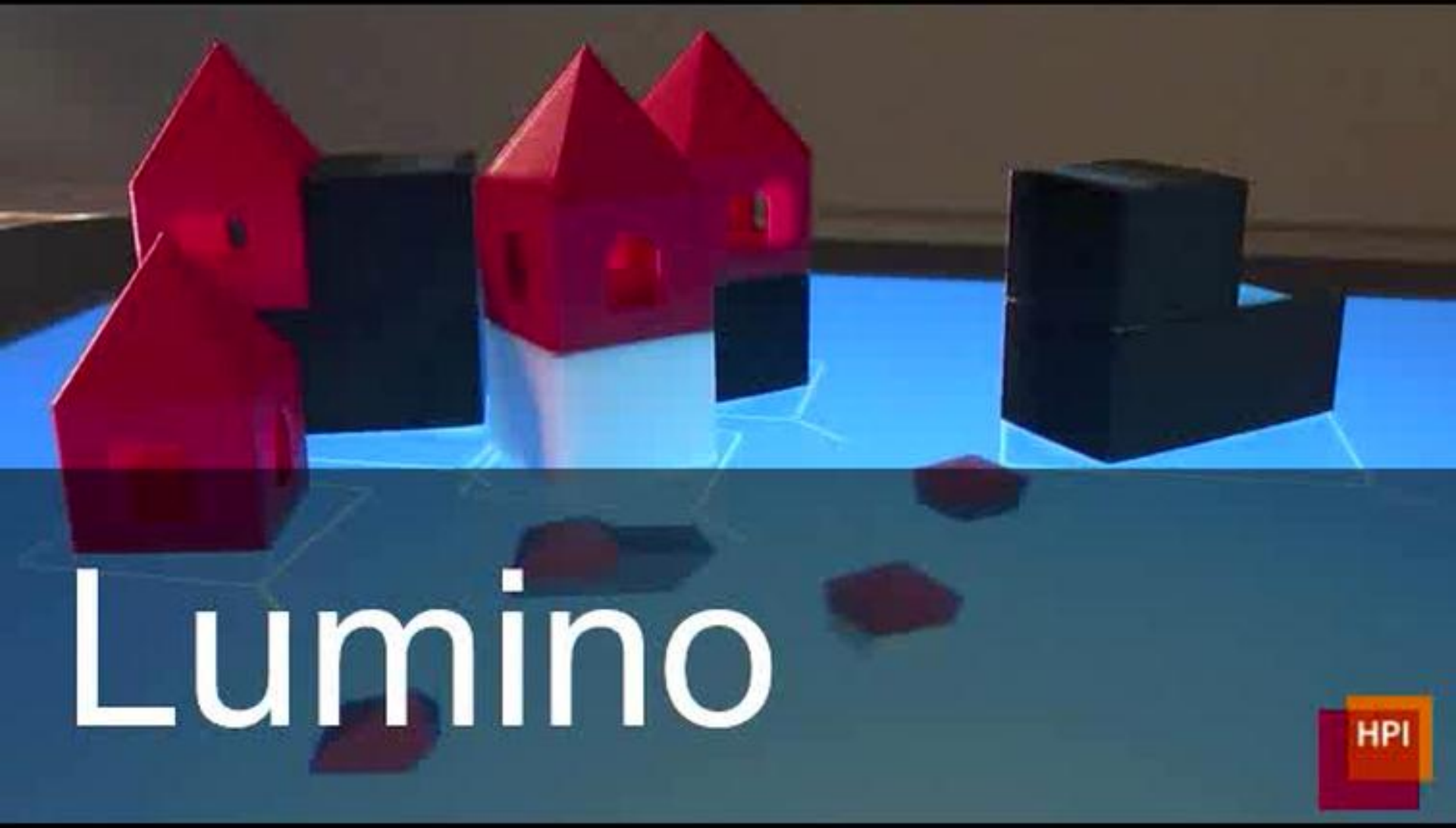
…we started applying this to **other areas.**
we needed **physical contact** though to track

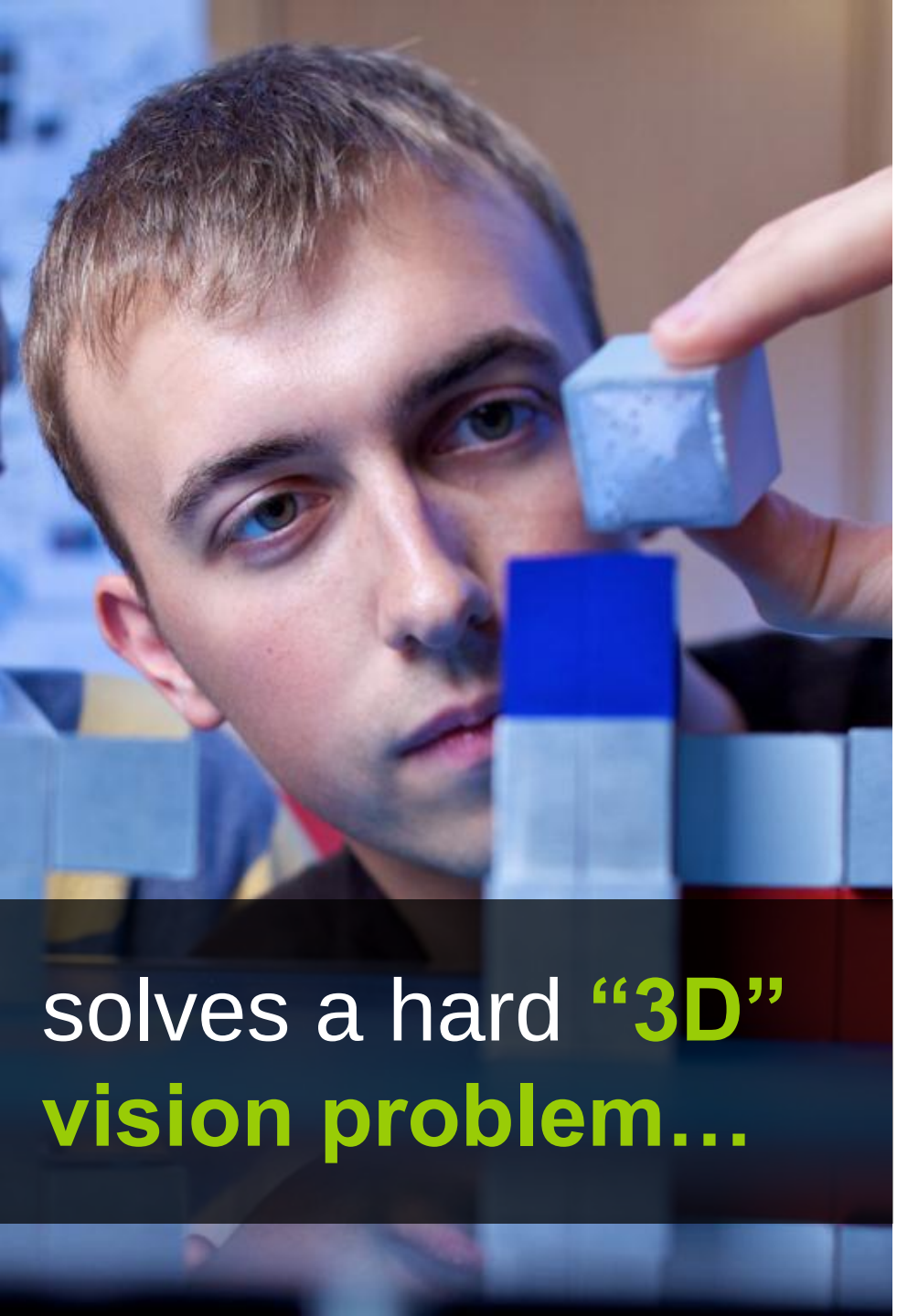

#2
object gravitate towards surface on… tabletop


lumino



markers allow table to recognize object **in touch the surface…** we allow for **3D constructions**


Lumino
HPI



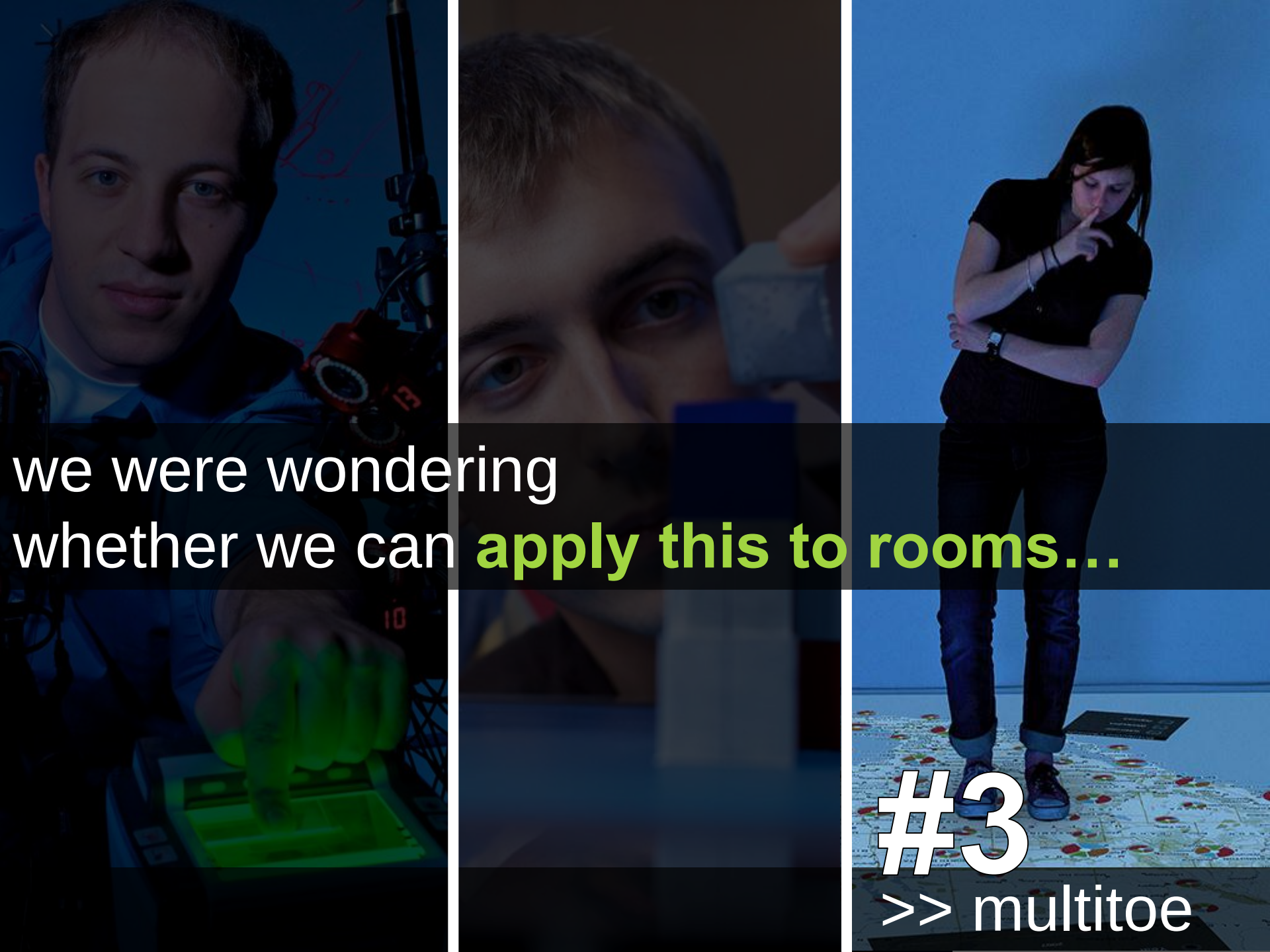
solves a hard **“3D” vision problem…**

…in 2D

gravity:

almost anything that happens in 3-space

manifests itself on the surface


we were wondering
whether we can apply this to rooms…
#3
>> multitoe

head tracking got us inspired.

what else can we infer about **space above the floor?**

smart rooms based on m ltitouch…
can we **look after** inhabitants?

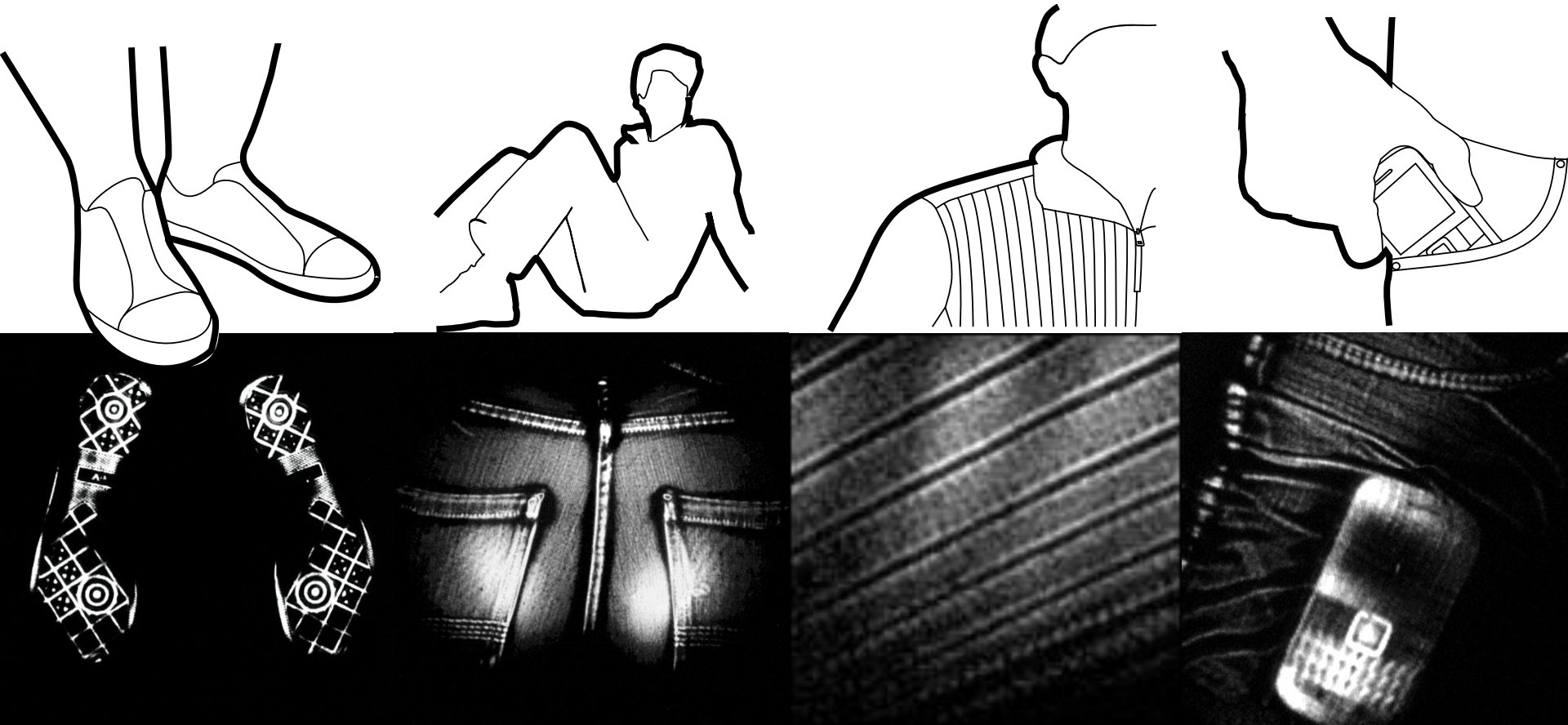

[unmousepad
Rosenberg, Perlin]
thin, light, & inexpensive, hi-res pressure sensing is **just around the corner**


roll it out, plug it in...

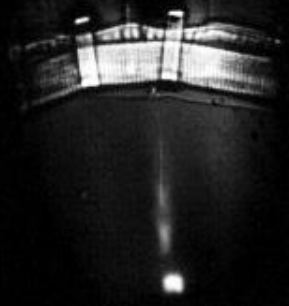

in the meantime: 8m2 rear-projection

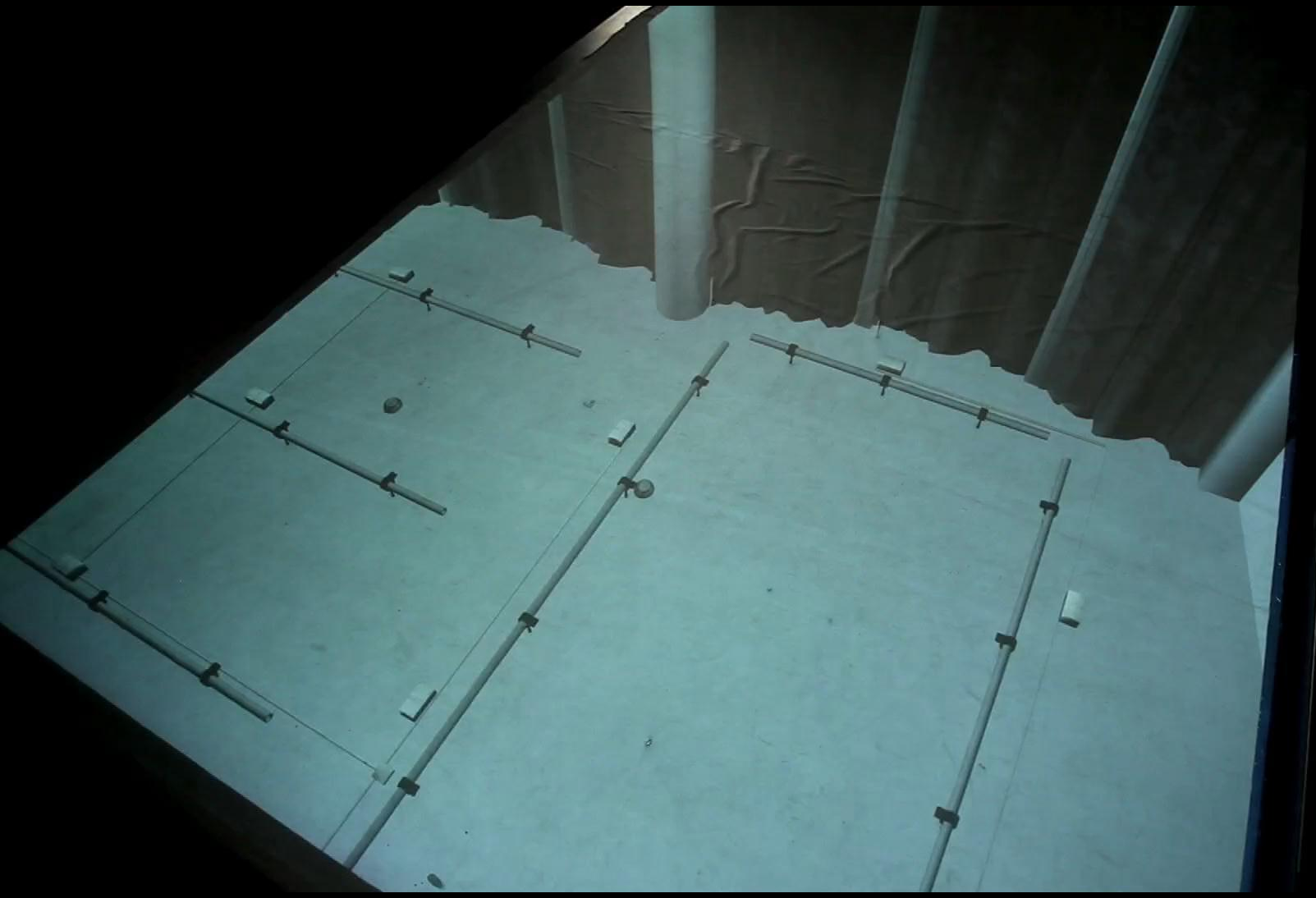
bringing the previous ideas together...

many types of objects have a **“fingerprint”**




building blocks become furniture





summary

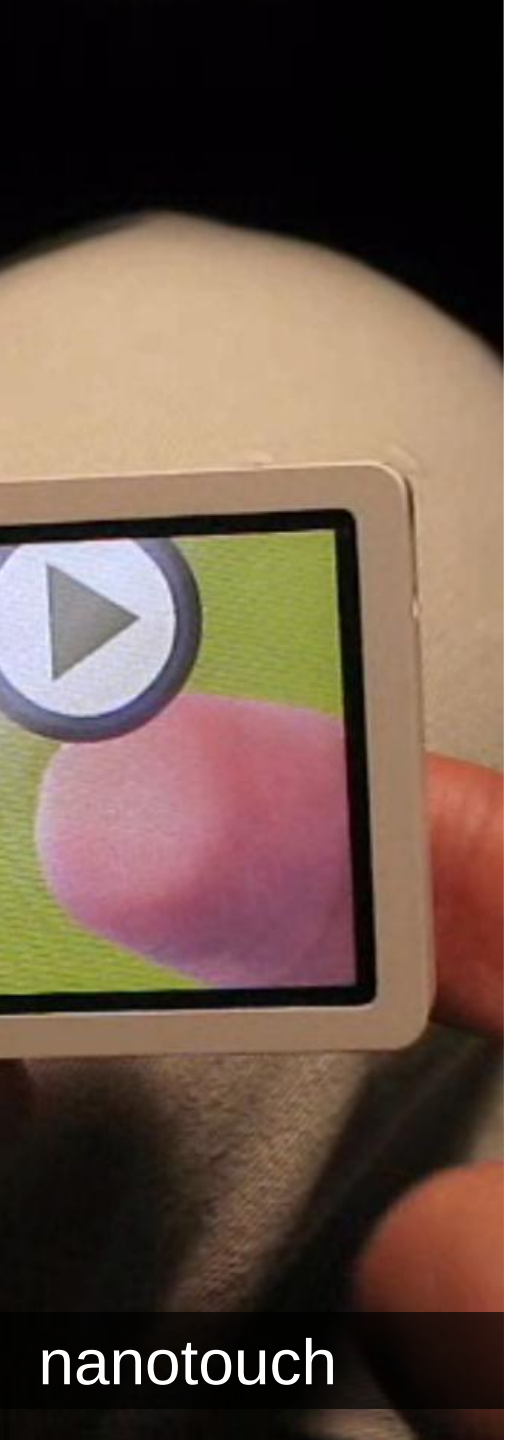
the world around us is Euclidean

→ **users understand** the laws:

touching, pointing, ballistics, inertia…

sensing users in 3D is great, but **not yet** unified

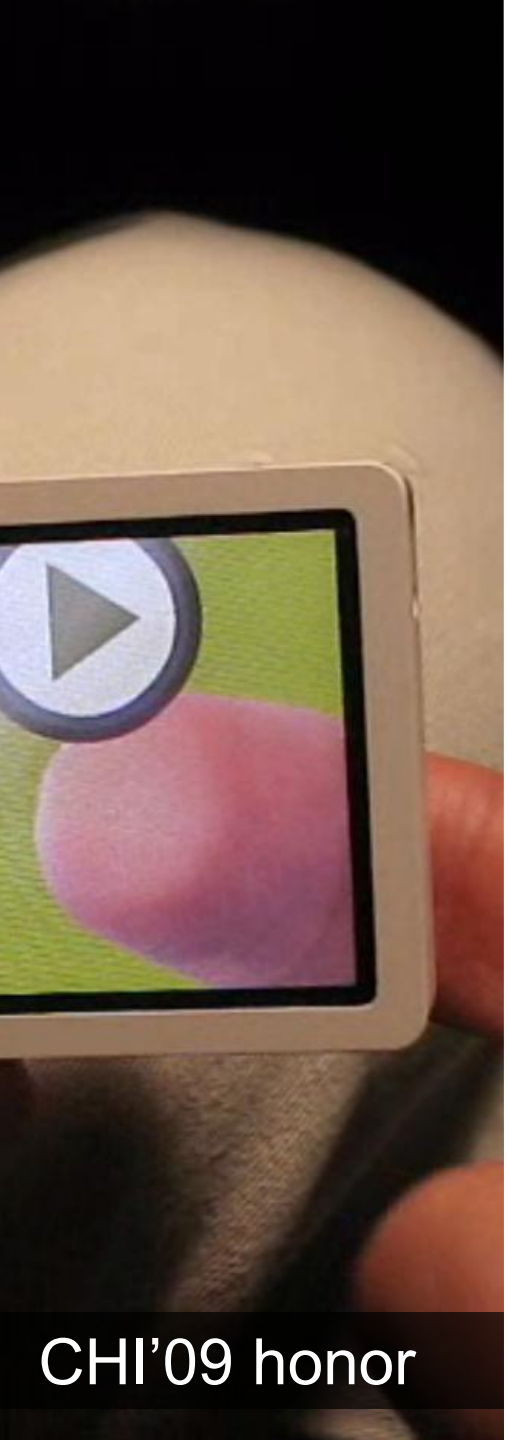

we think of gravityspace as a step forward


nanotouch


TDR


imaginary


constructable

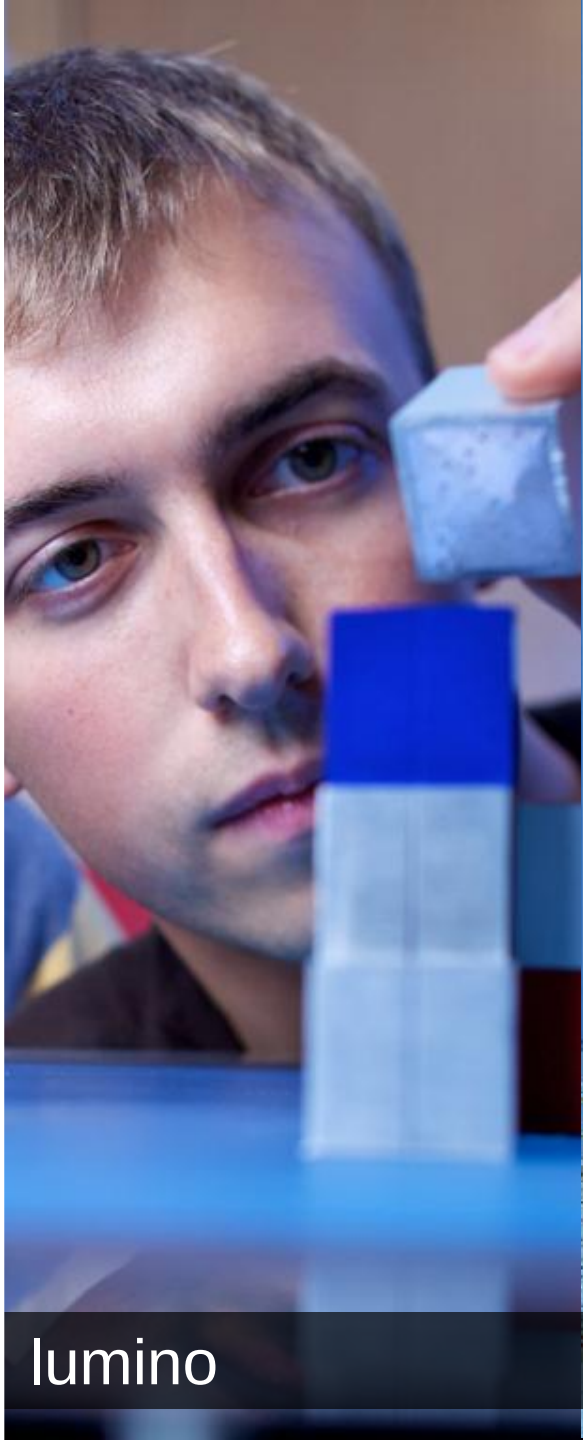

CHI’09 honor


UIST’11 honor


CHI’11

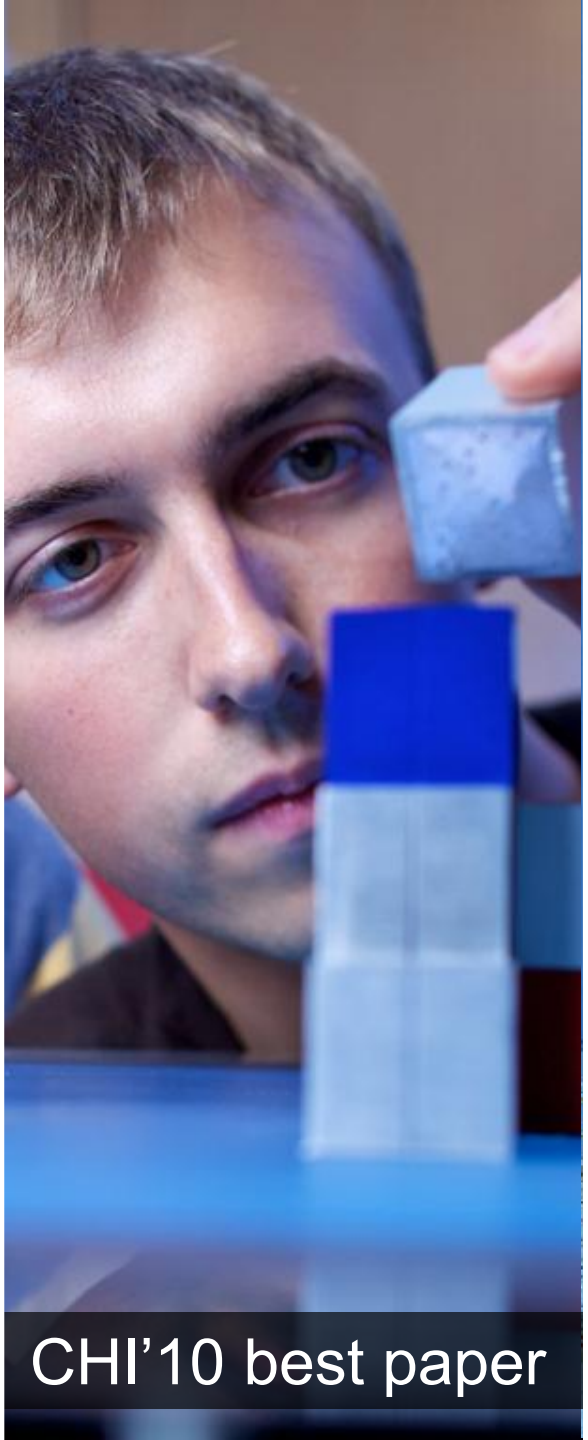

UIST’12


ridgepad


lumino

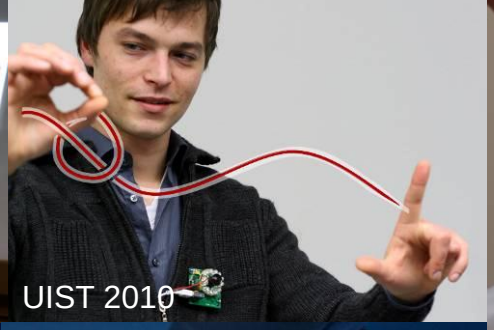

multitoe

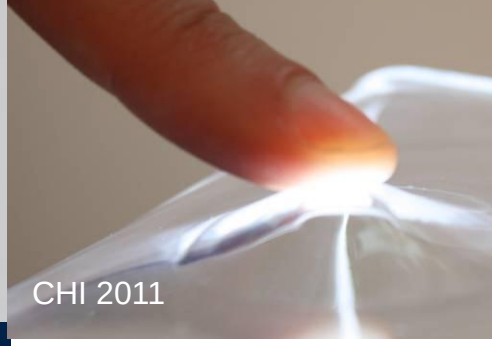

CHI’10, CHI’11

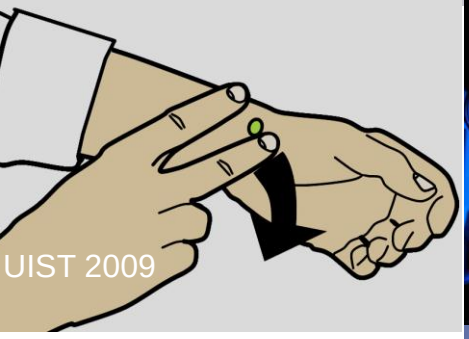

CHI’10 best paper

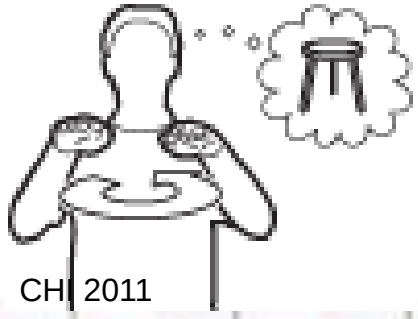

UIST’11

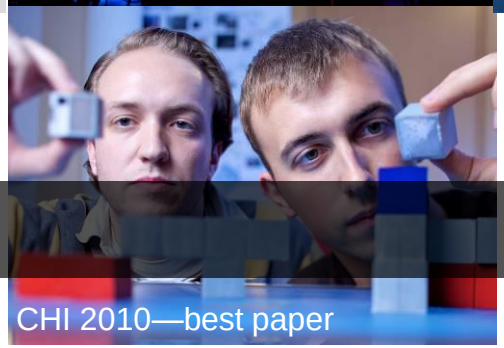
supported by:







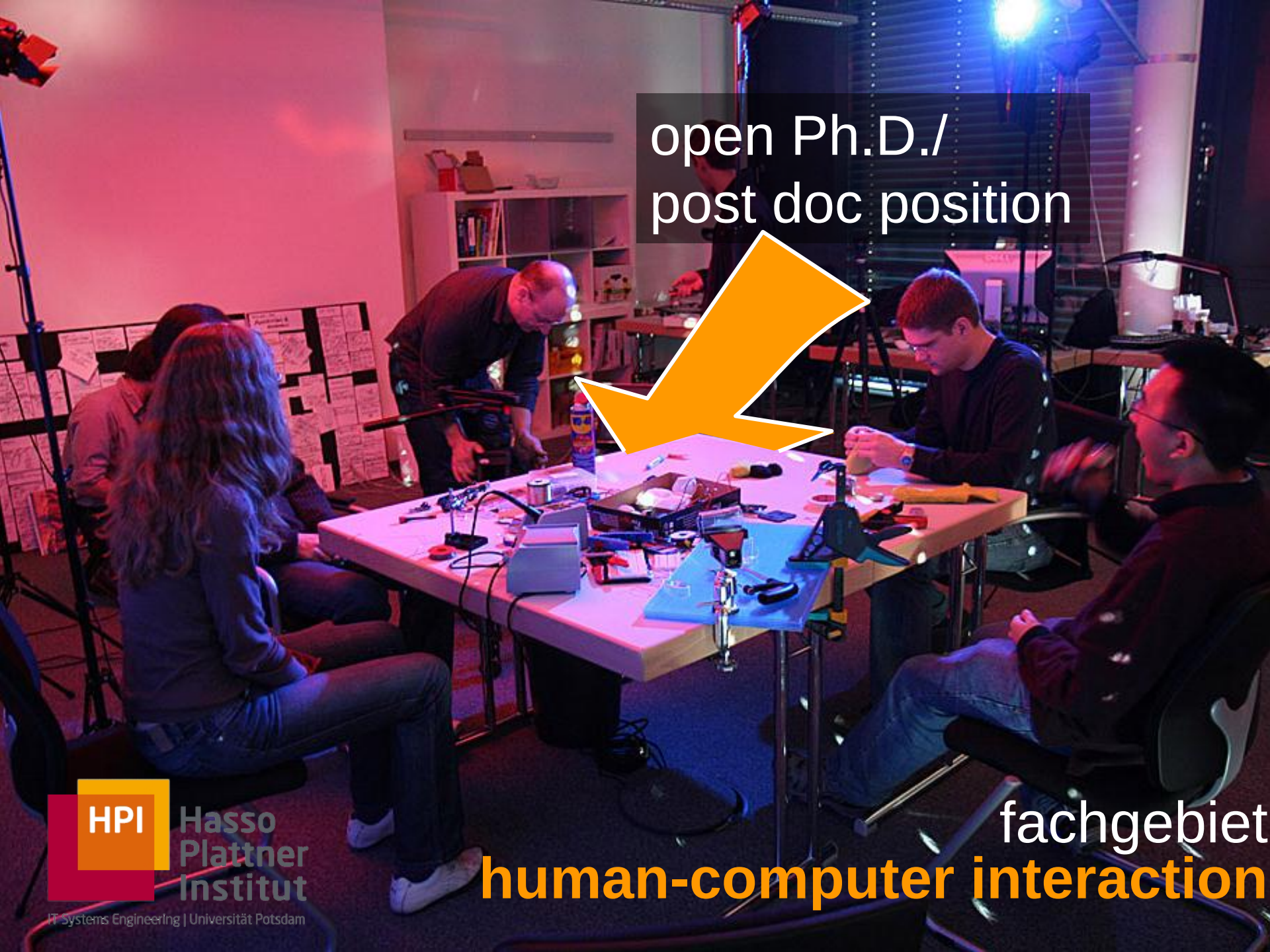




questions?

HPI Hasso Plattner Institut

done



HPI Hasso Plattner Institut

IT Systems Engineering | Universität Potsdam

fachgebiet

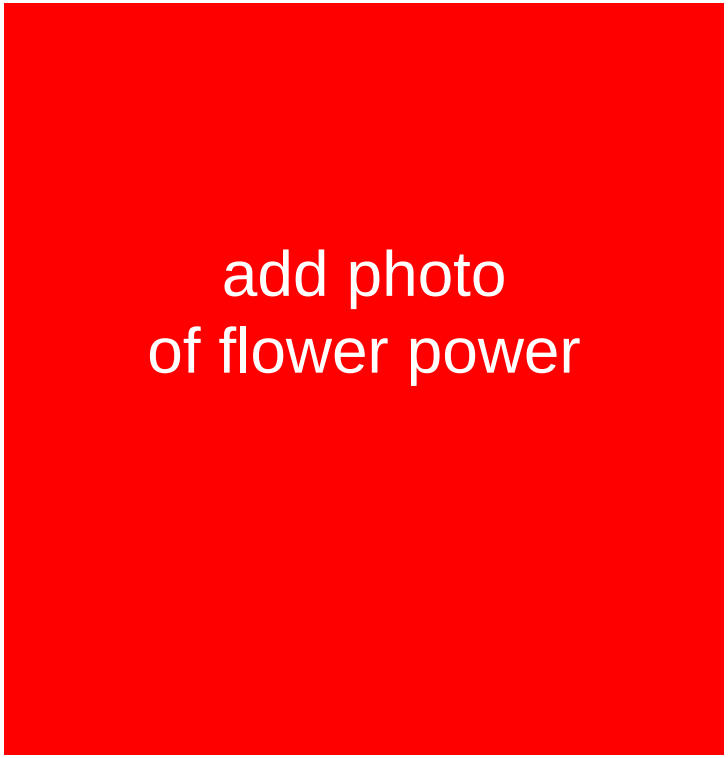
human-computer interaction

HPI Hasso Plattner Institut
IT Systems Engineering | Universität Potsdam

enabling a vision...


1:n
1960s
1:1
1980s
m:1
2000s


m:1
ubicomp
1::mobile ←
2::smart rooms ←



we left the 60s…

add photo
of Top Gun Tom cruise

…to enter the 80s