

NUI



patrick baudisch
MSR faculty summit 2012

HPI

**Hasso
Plattner
Institut**



summary:

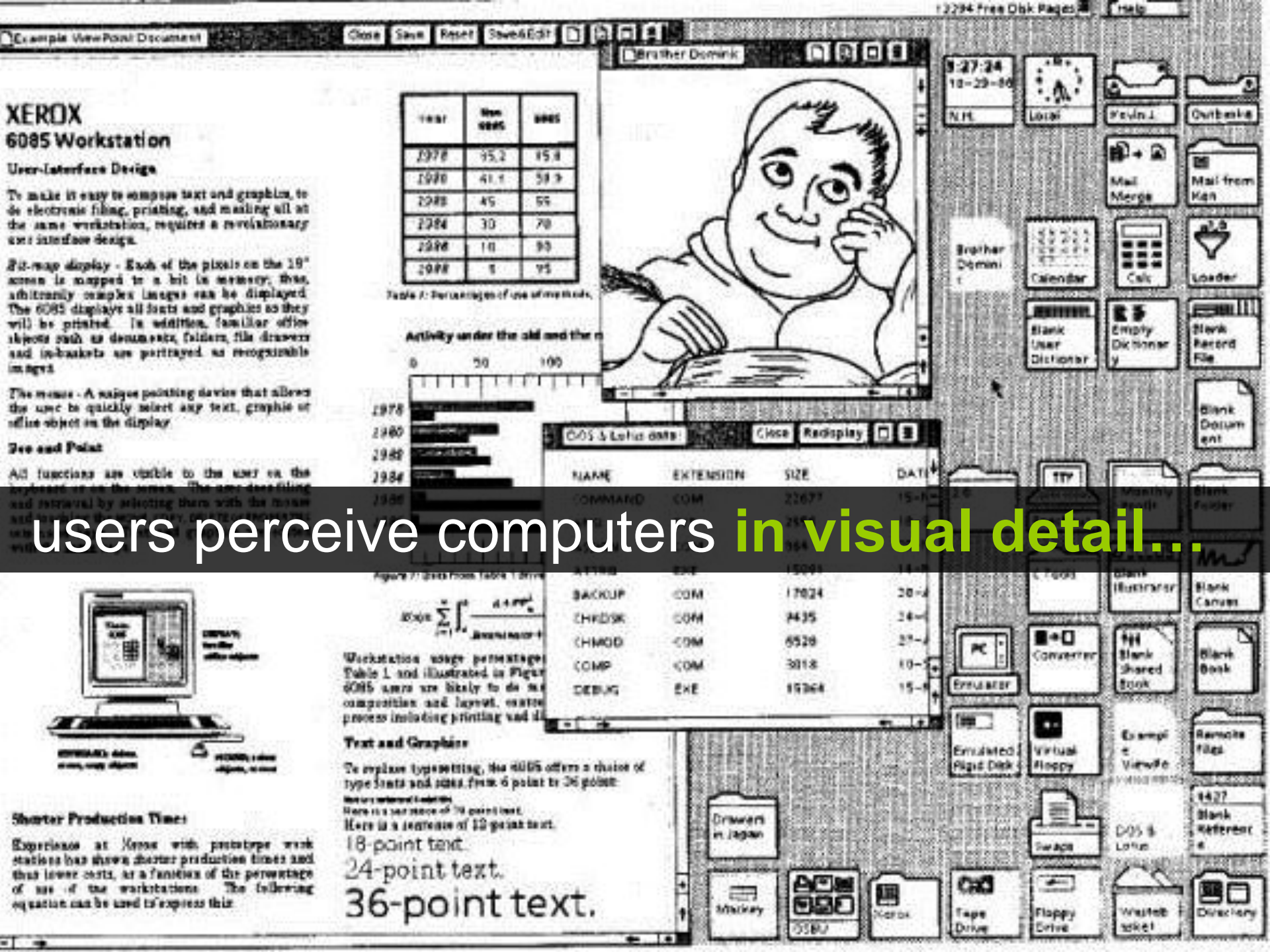
natural := **unifying** interaction space



and, well, there will be **feet**

towards NUI

traditional interaction with computers was (and is)
asymmetric...



XEROX 6085 Workstation

User-Interface Design

To make it easy to compose text and graphics, to do electronic filing, printing, and making all at the same workstation, requires a revolutionary user interface design.

Bit-map display - Each of the pixels on the 19" screen is mapped to a bit in memory; thus, arbitrarily complex images can be displayed. The 6085 displays all texts and graphics so they will be printed. In addition, familiar office objects such as documents, folders, file drawers and in-baskets are portrayed as recognizable images.

The mouse - A unique pointing device that allows the user to quickly select any text, graphic or office object on the display.

See and Point

All functions are visible to the user on the keyboard or on the screen. The user does filing and retrieval by selecting them with the mouse and viewing the screen. The user can see the screen and the keyboard at the same time.

Year	Non-Word	Word
1978	95.2	15.8
1980	41.1	59.9
1982	45	55
1984	30	70
1986	10	90
1988	5	95

Table 1: Percentages of use of methods.

Activity under the old and the new



NAME	EXTENSION	SIZE	DATE
COMMAND	COM	22677	15-1
ATTN	EXE	15091	14-8
BACKUP	COM	17024	20-4
CHKDSK	COM	4435	14-8
CHMOD	COM	6528	27-4
COMP	COM	3018	10-8
DEBUG	EXE	19364	15-1

Figure 1: Data from Table 1 drive

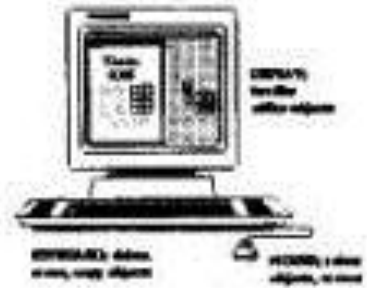
$$f(x) = \int_{-1}^1 \frac{1}{\sqrt{1-x^2}} dx$$

Workstation usage percentage Table 1 and illustrated in Figure 6085 users are likely to do text composition and layout, create process including printing and d...

Text and Graphics

To replace typesetting, the 6085 offers a choice of type fonts and sizes from 6 point to 36 point.

Here is a test piece of 36 point text.
 Here is a test piece of 24 point text.
 18-point text.
 24-point text.
 36-point text.

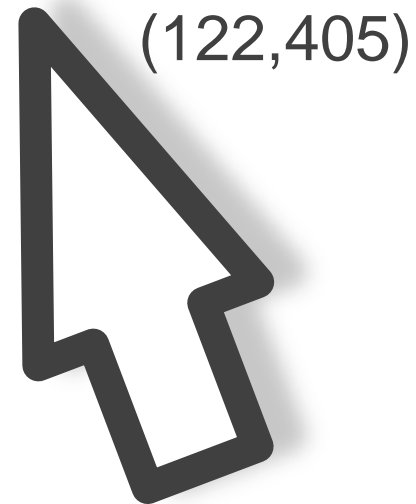


Shorter Production Times:

Experiences at Xerox with prototype work stations has shown shorter production times and thus lower costs, as a function of the percentage of use of the workstations. The following equation can be used to express this:



...in contrast, computer perceive users as



user := a **moving crosshair**



we are still living in 1968

INTRODUCTION

OVERALL ABOUT PROGRAM
NLS AS AN "INSPIRED"
CONTROL TECHNIQUES
NLS IMPLEMENTATION
USAGE
ACTIVITIES
CREDITS

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**







A man is shown from the chest up, wearing a VR headset with sensors on the sides and a black motion capture suit with red accents. He is looking directly at the camera with a neutral expression. The background is a dimly lit studio or laboratory with various pieces of equipment, including a large projection screen on the left and a desk with a person working in the distance. The lighting is focused on the man, with some warm, orange-toned lights visible in the background.

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...

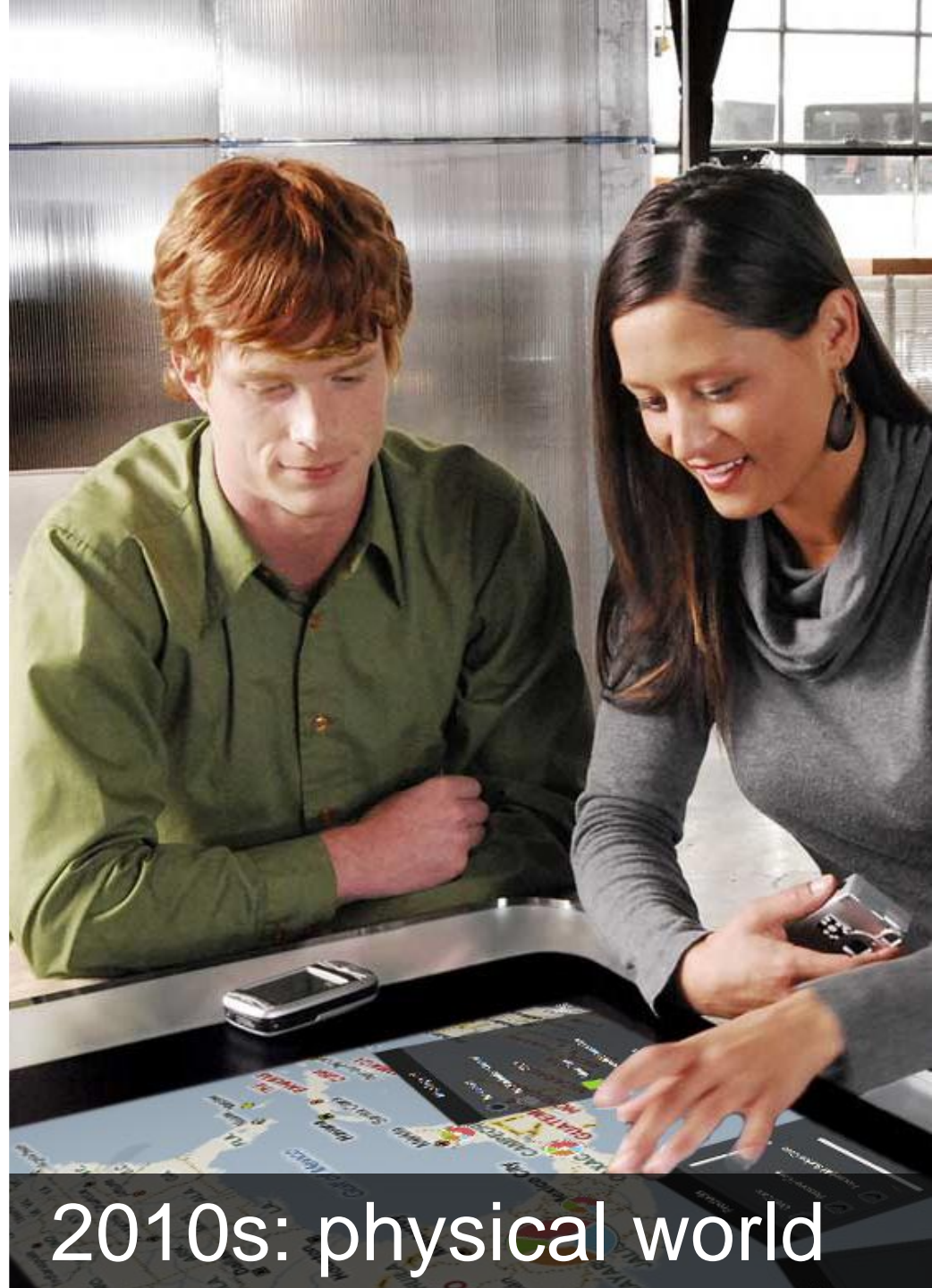


my definition:

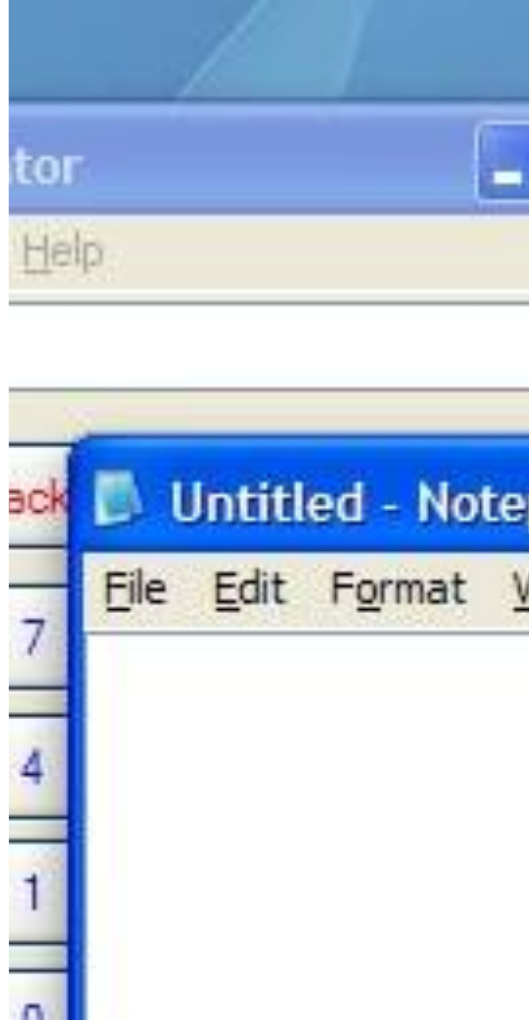
natural UI := a single **Euclidean space**



1970s: office

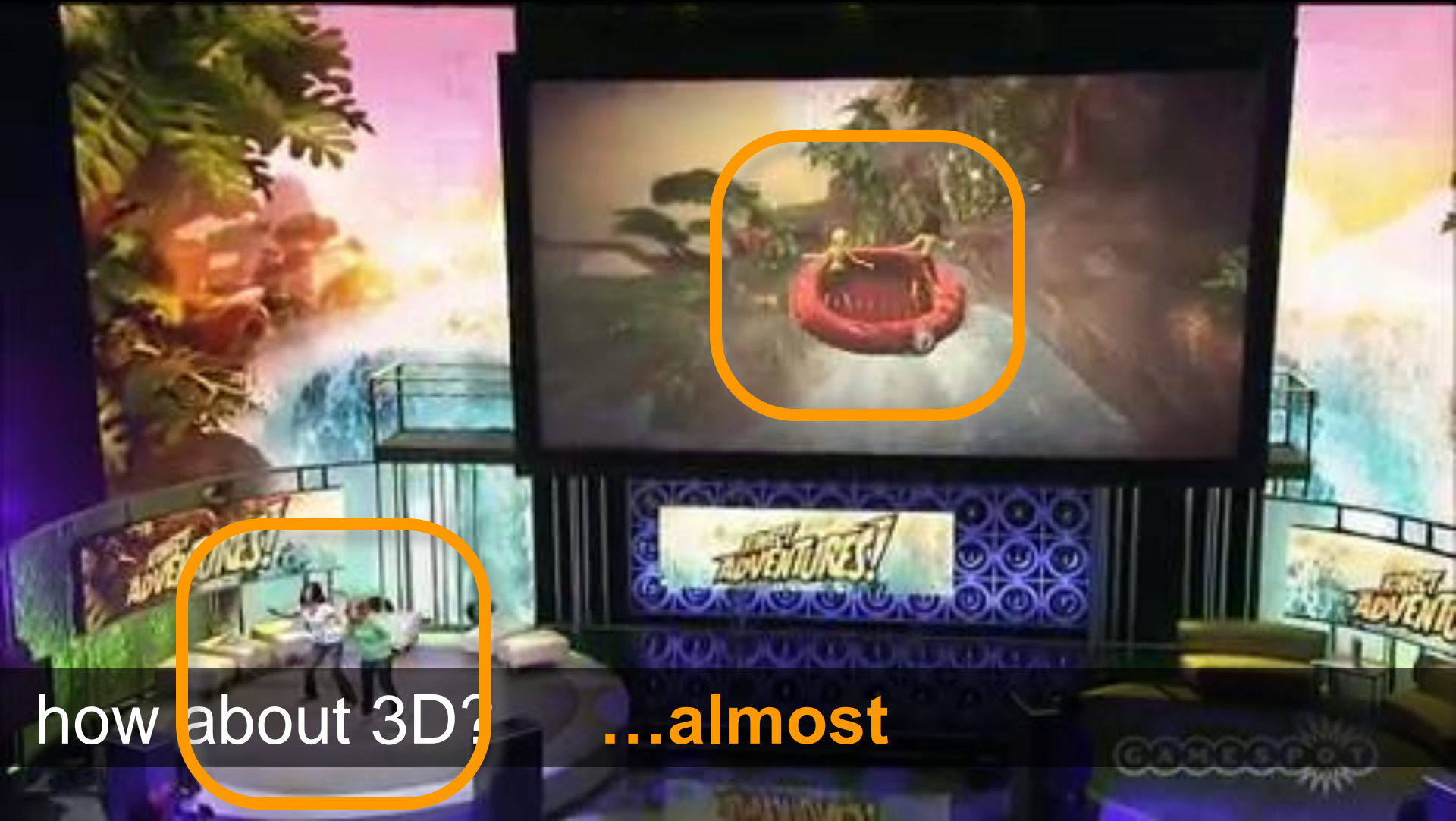


2010s: physical world



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

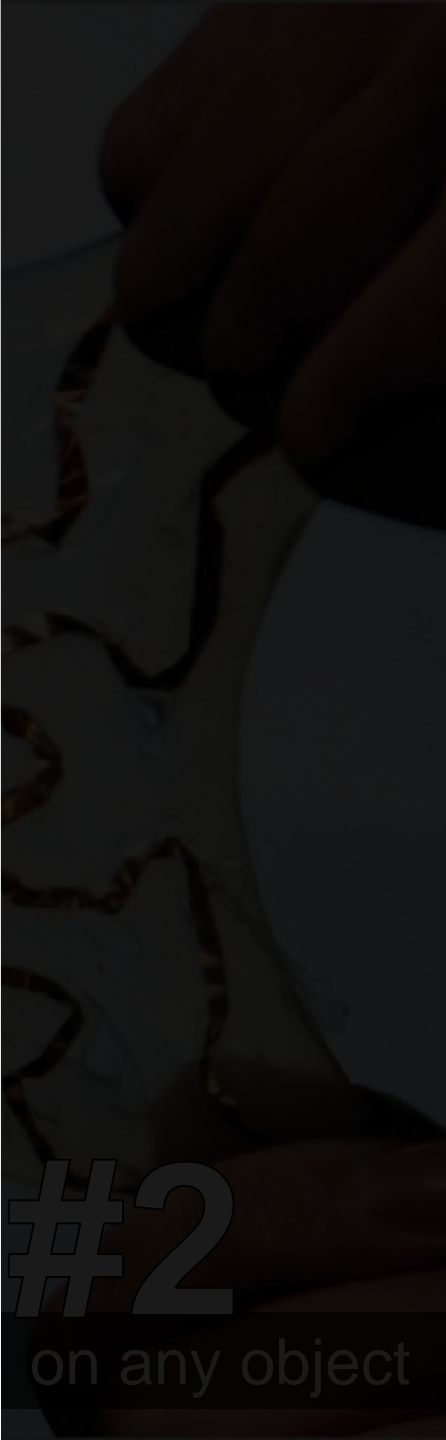


#4
or hazardous



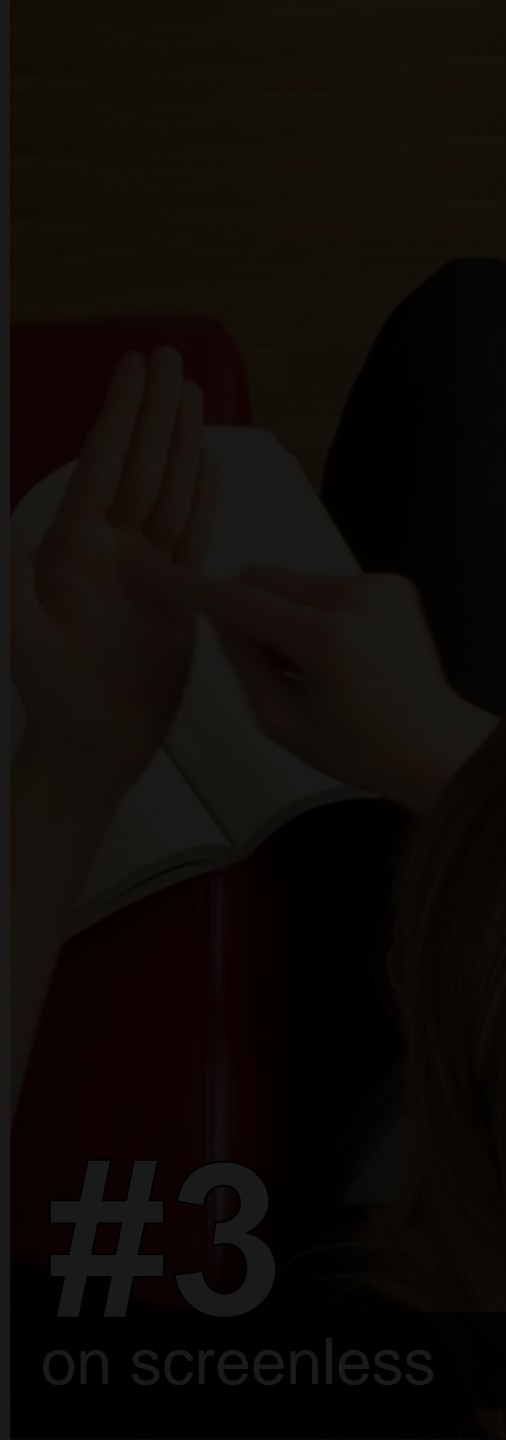
#1

in off-screen



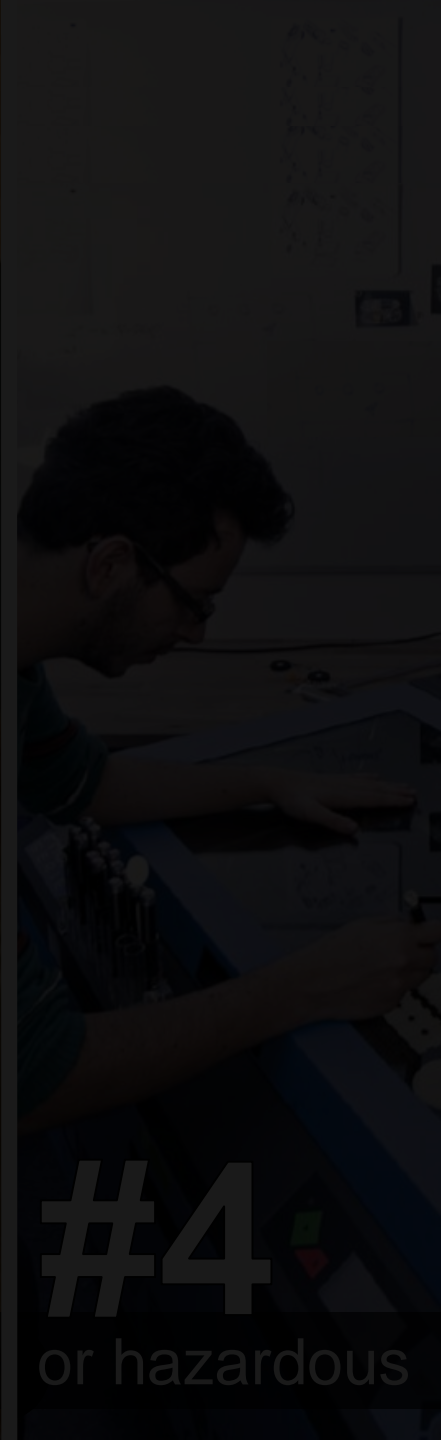
#2

on any object



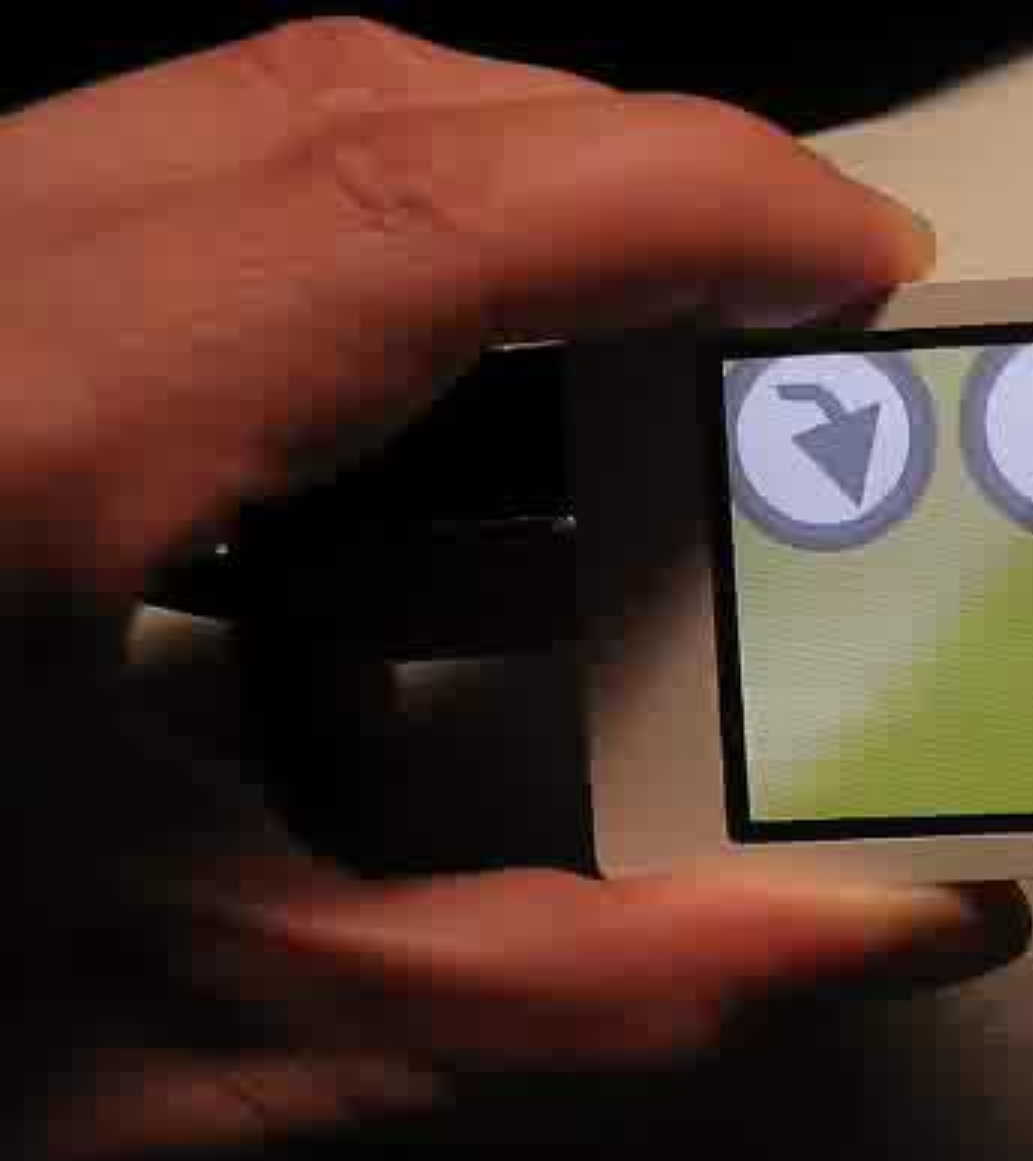
#3

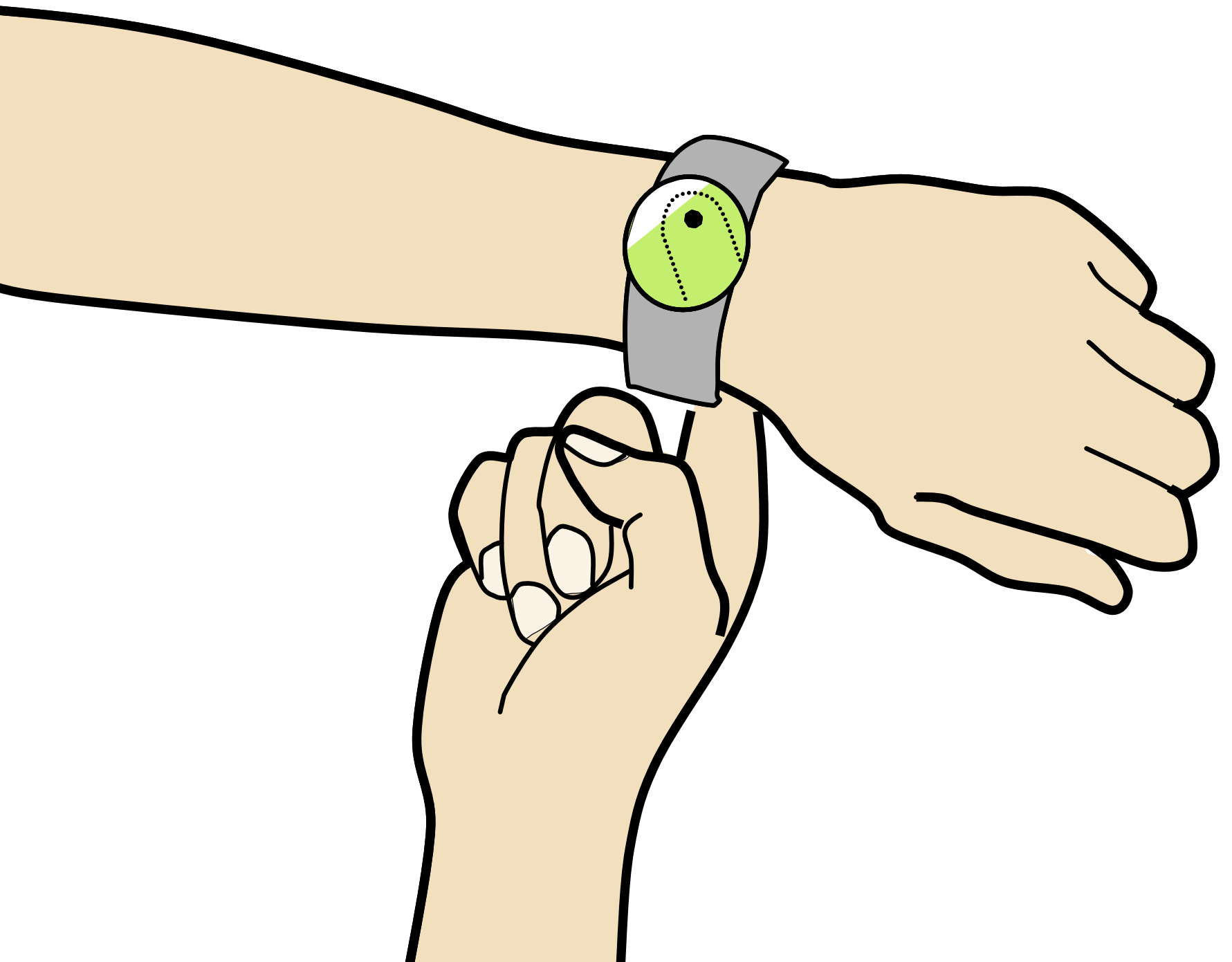
on screenless

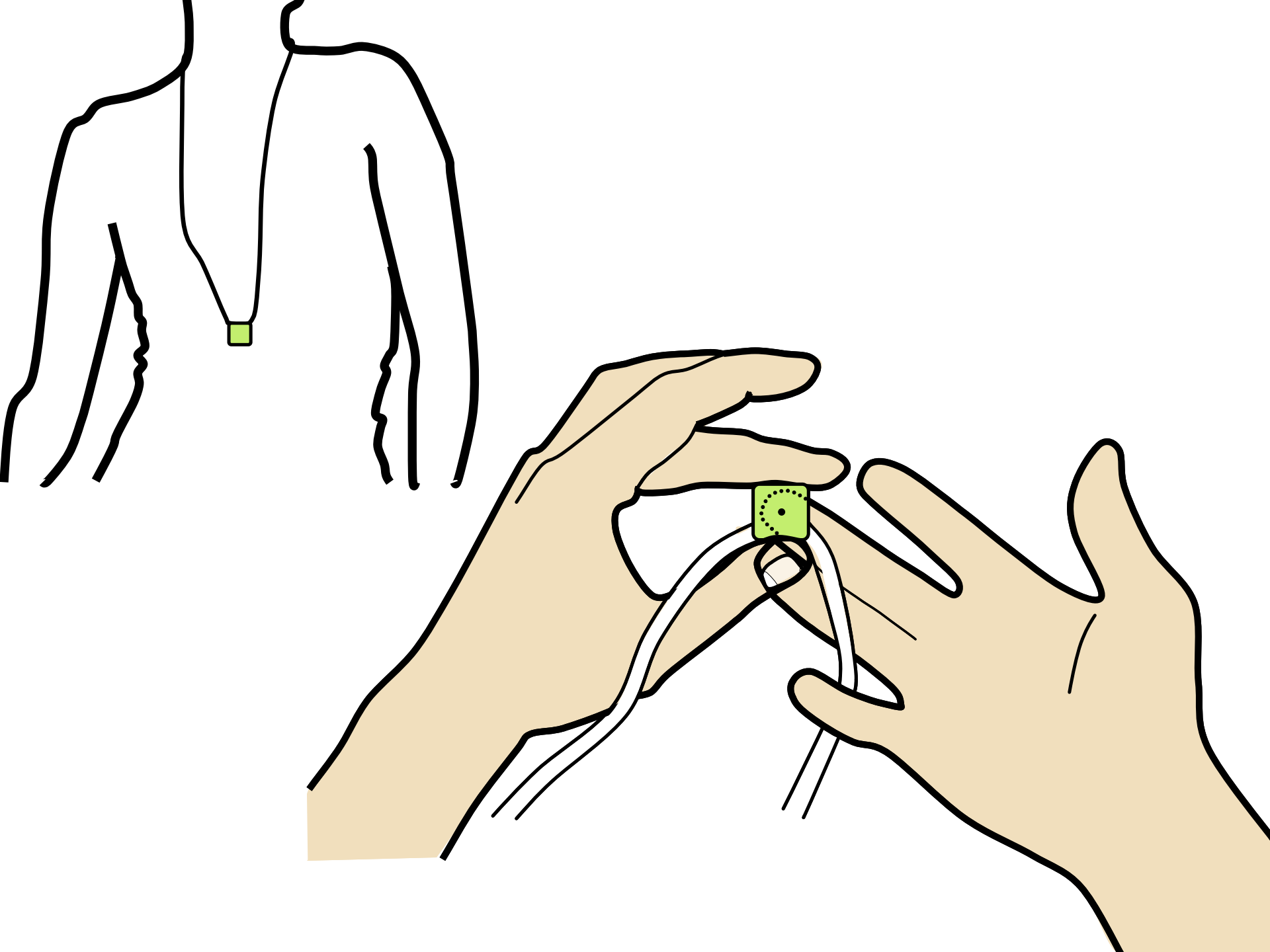


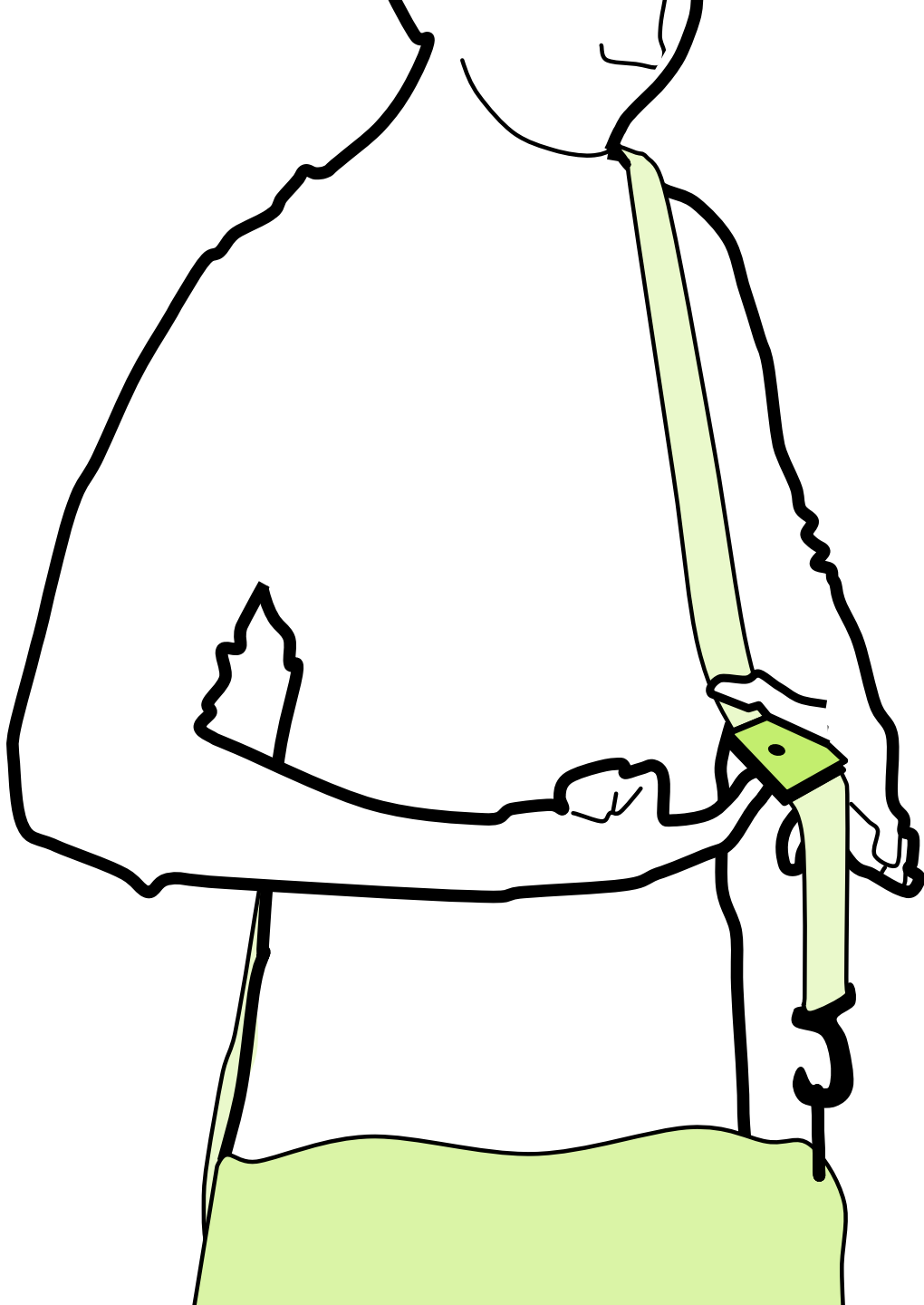
#4

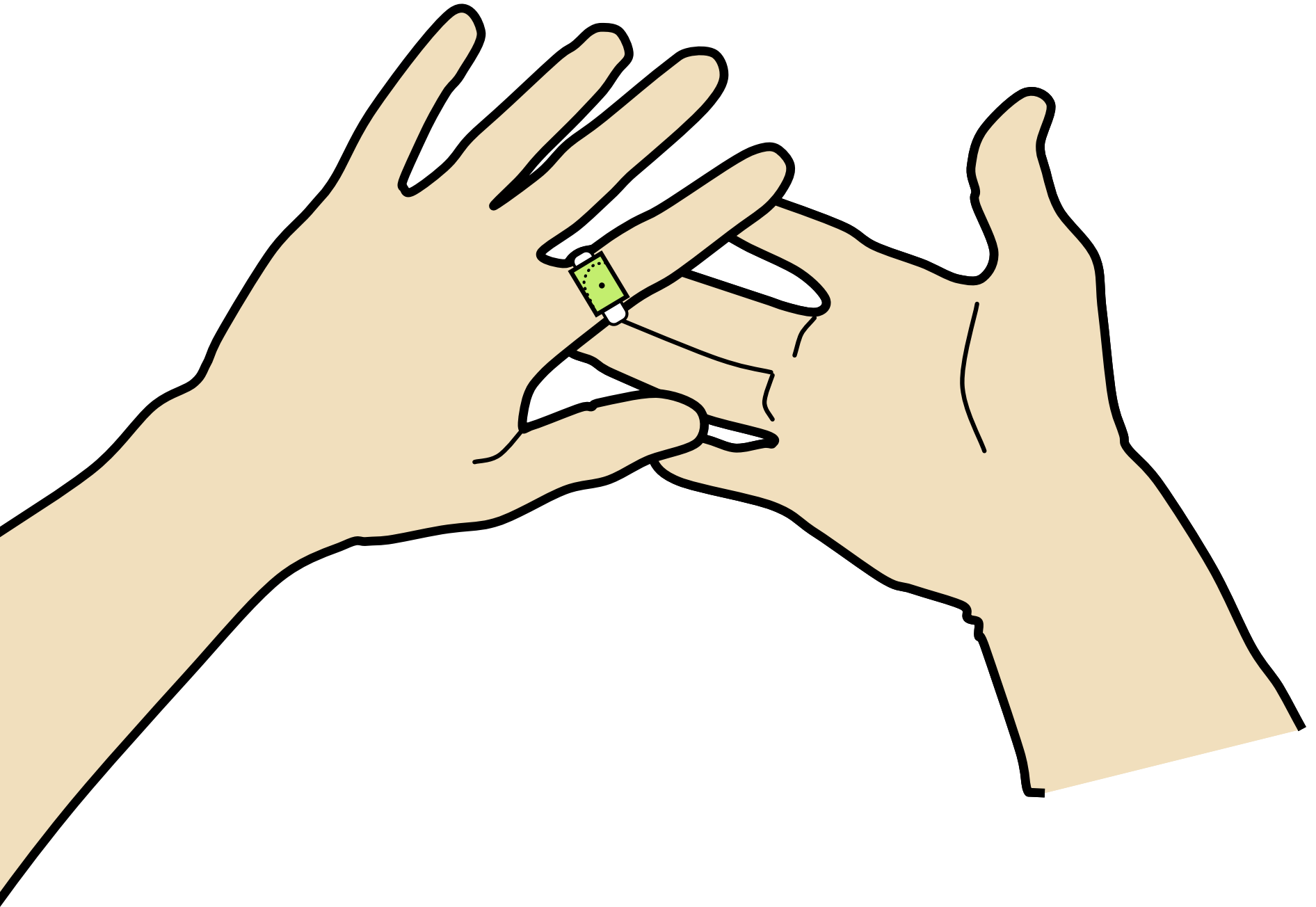
or hazardous





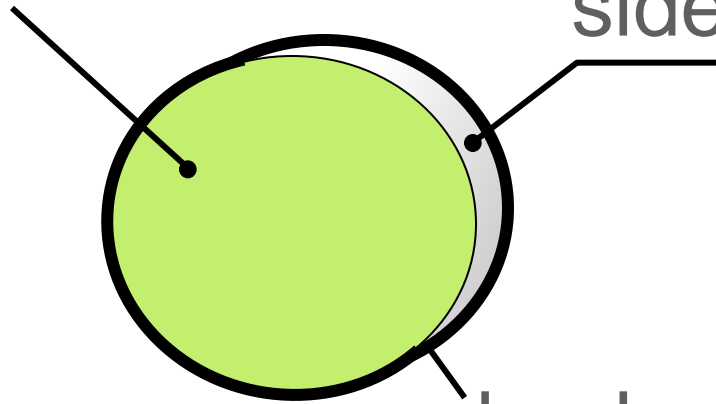






front = screen

sides = buttons



back = touch



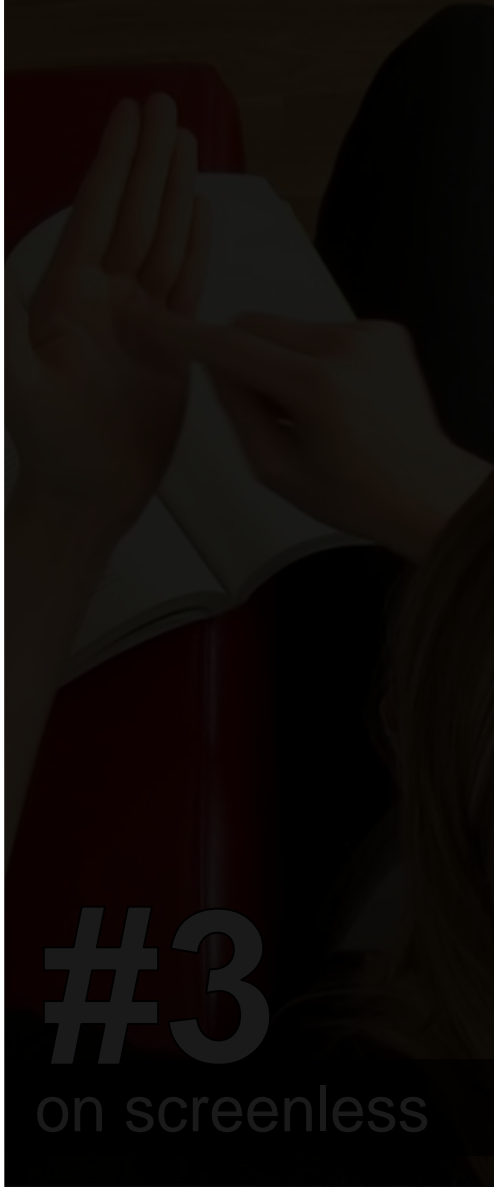
#1

in off-screen



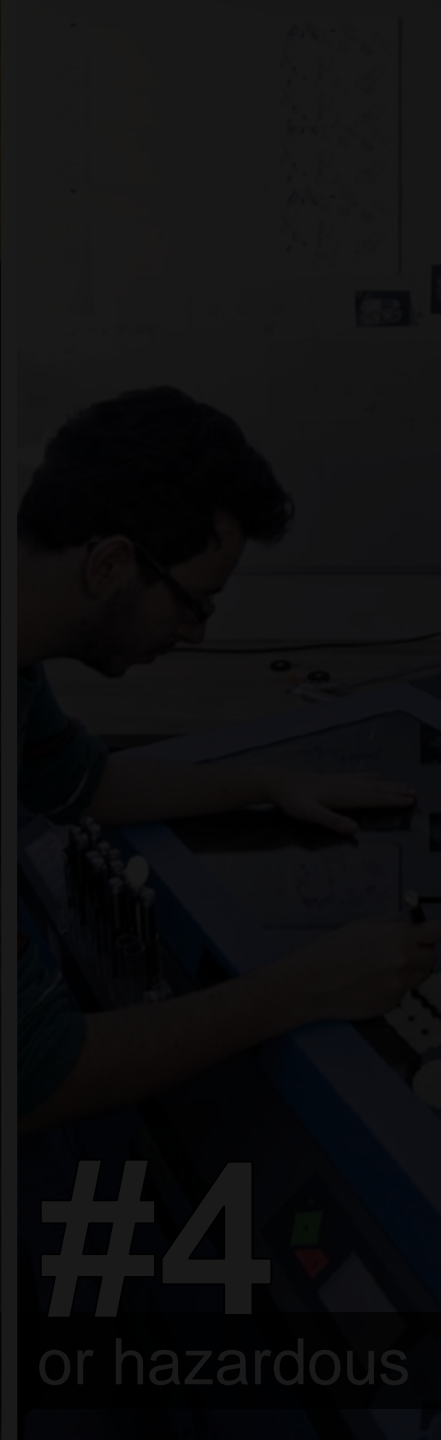
#2

on any object



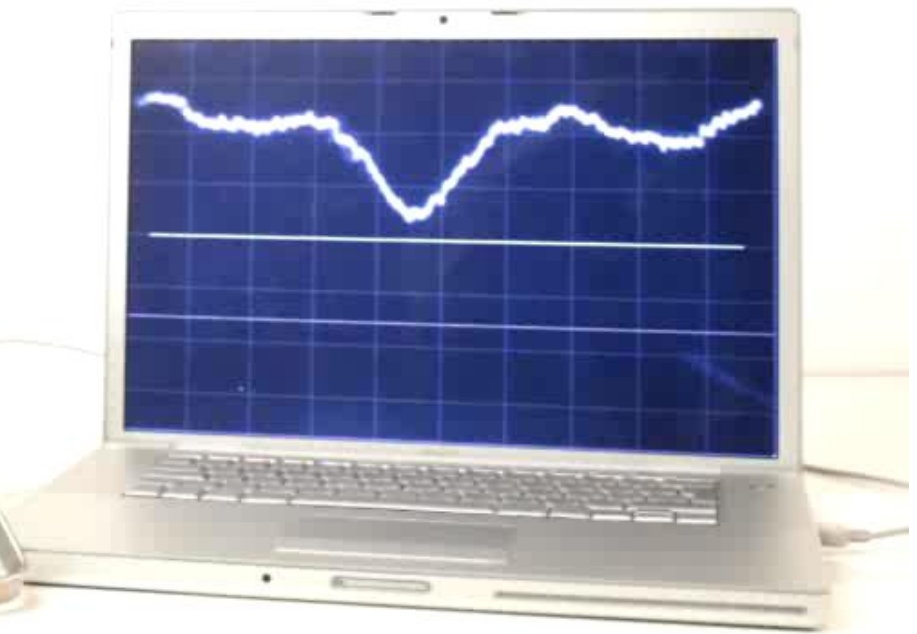
#3

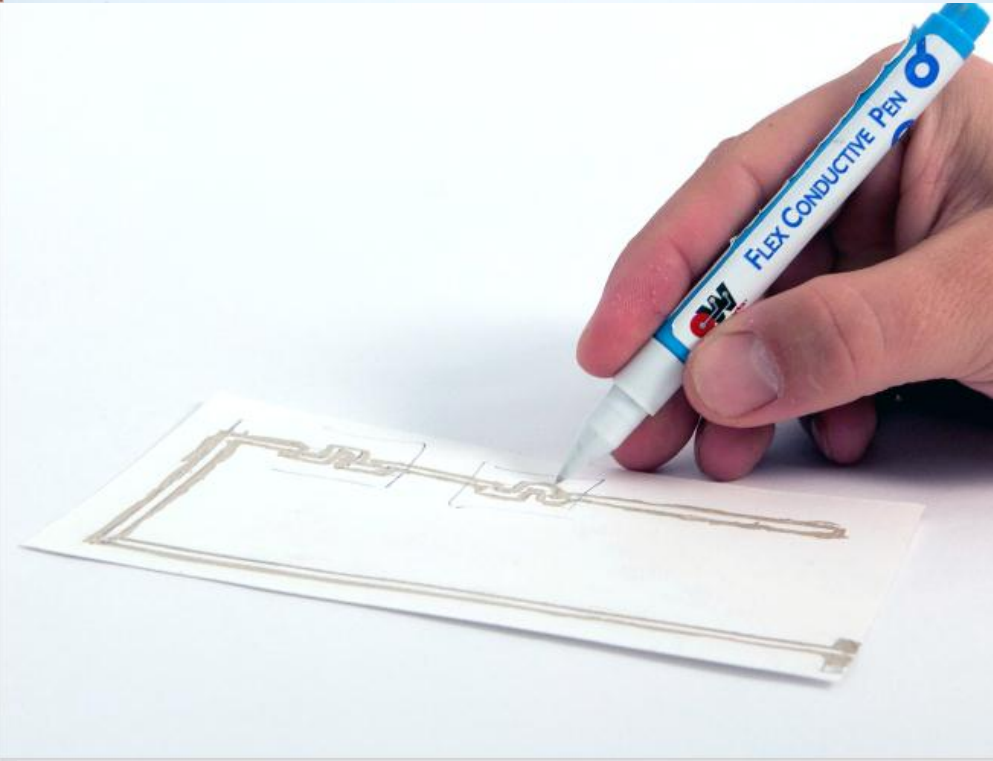
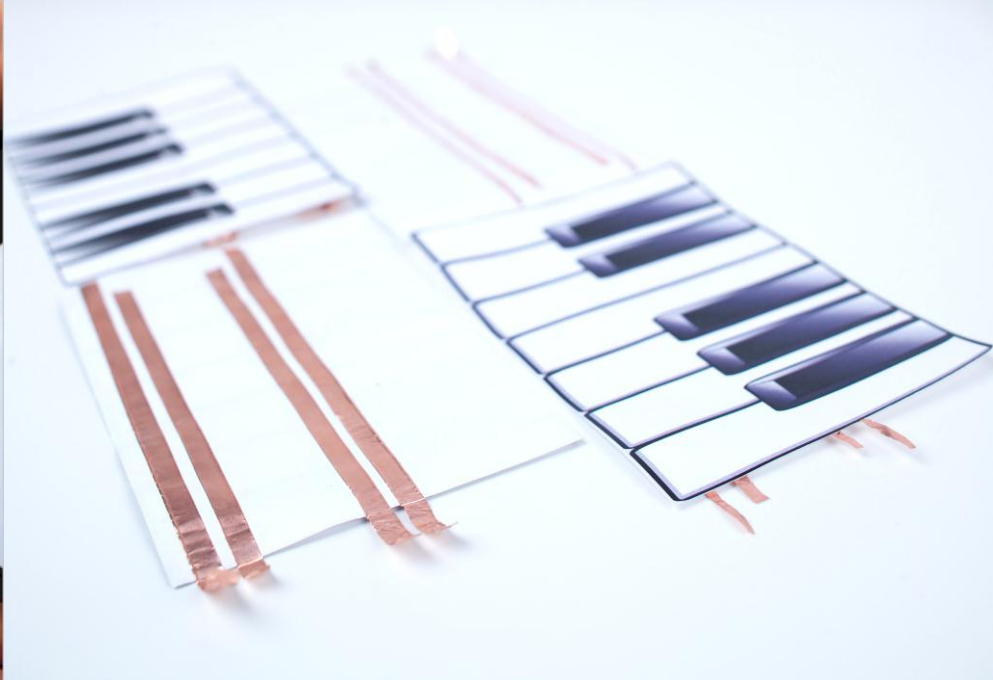
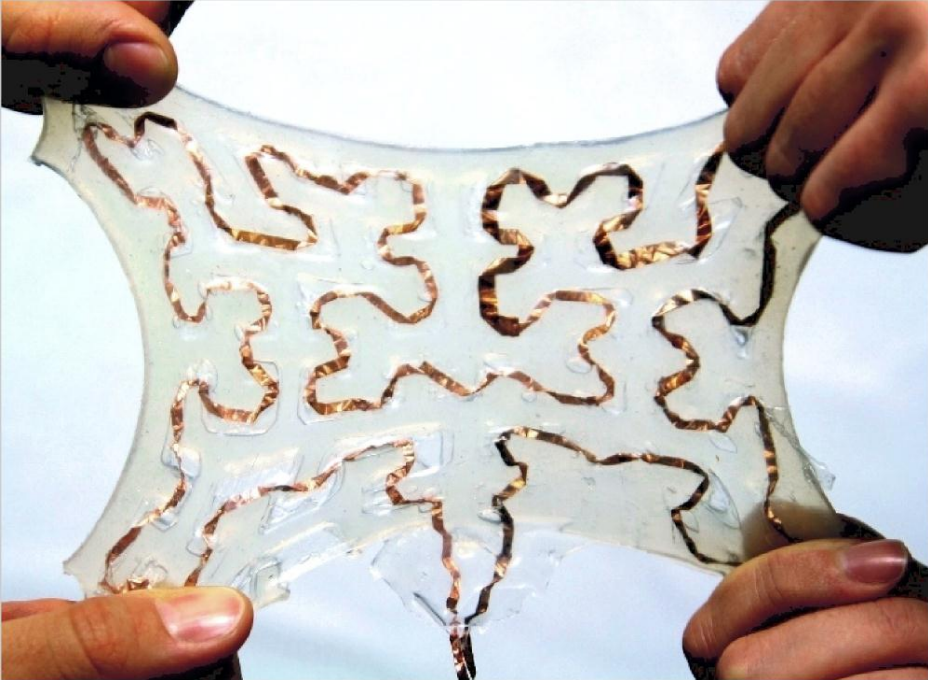
on screenless



#4

or hazardous

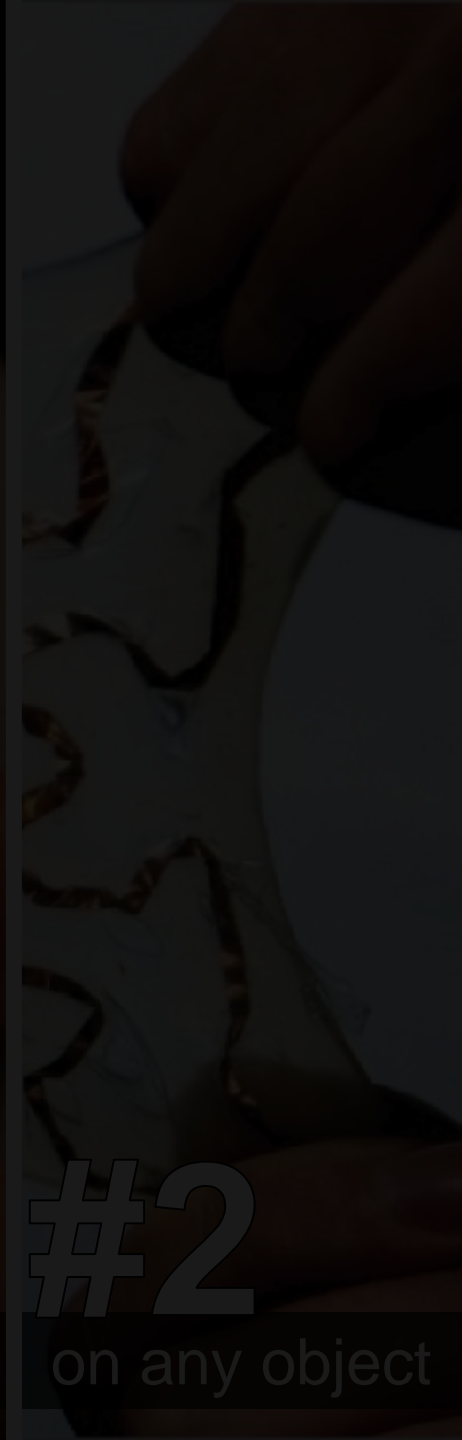






#1

in off-screen



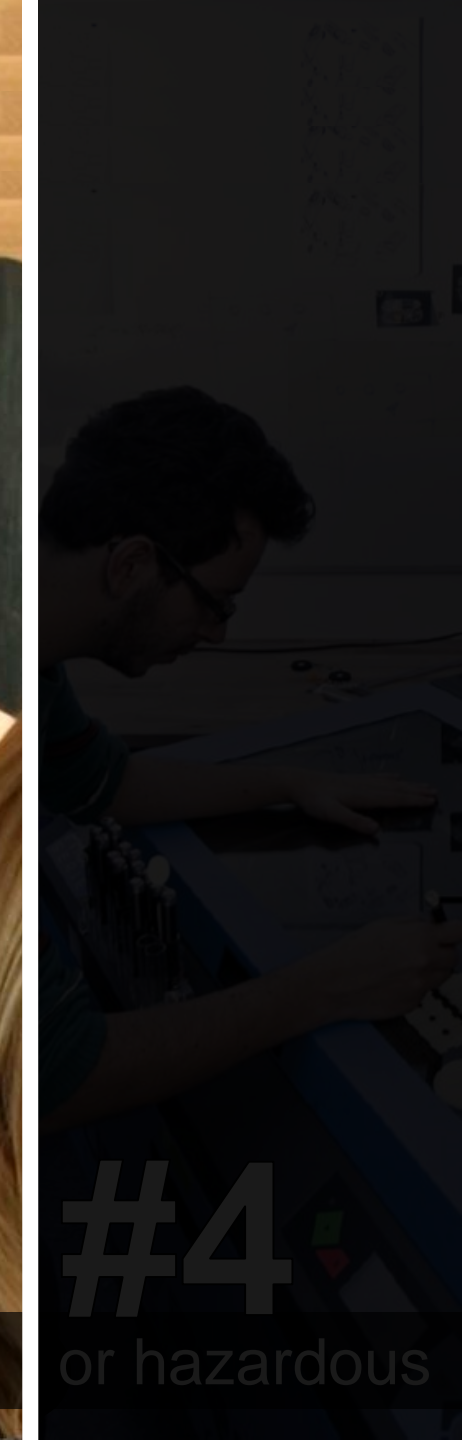
#2

on any object



#3

on screenless



#4

or hazardous



The logo consists of two overlapping squares: a larger magenta one on the left and a smaller orange one on the right. The letters 'HPI' are printed in white on the orange square.

HPI

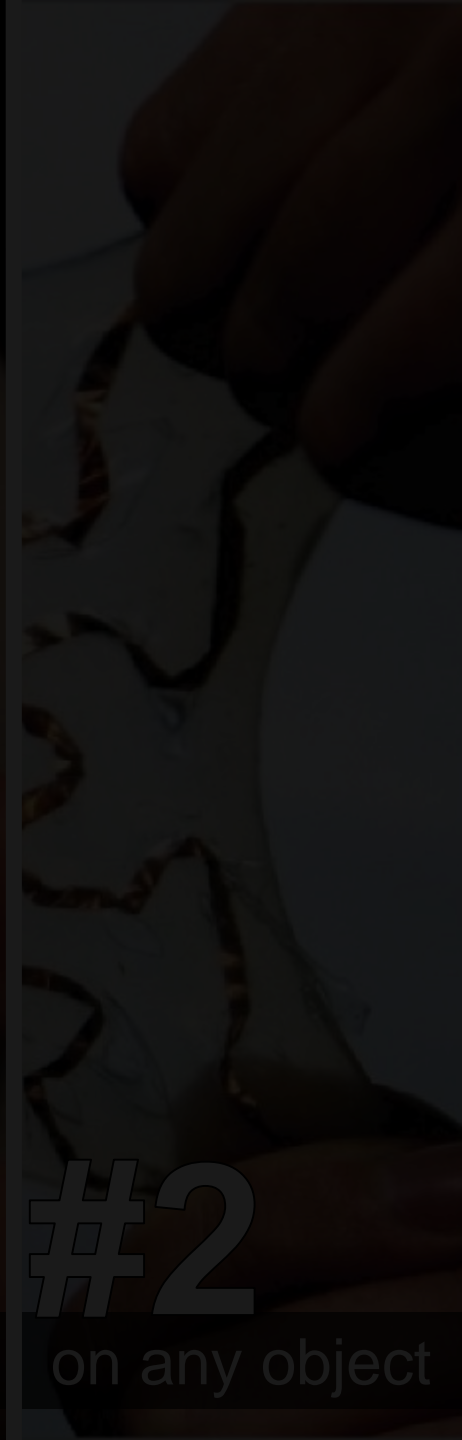
A top-down view of a person with long, wavy brown hair sitting on a red sofa. They are wearing a black top and black leggings, and are holding an open book with both hands, reading. The floor is made of light-colored wood.

Imaginary Phone



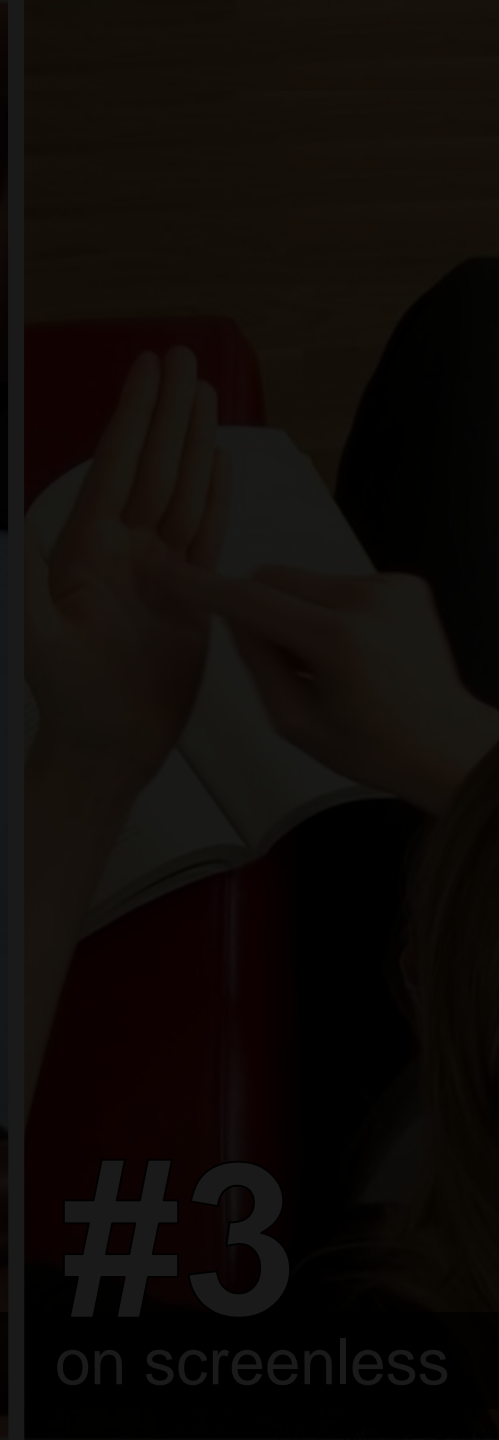
#1

in off-screen



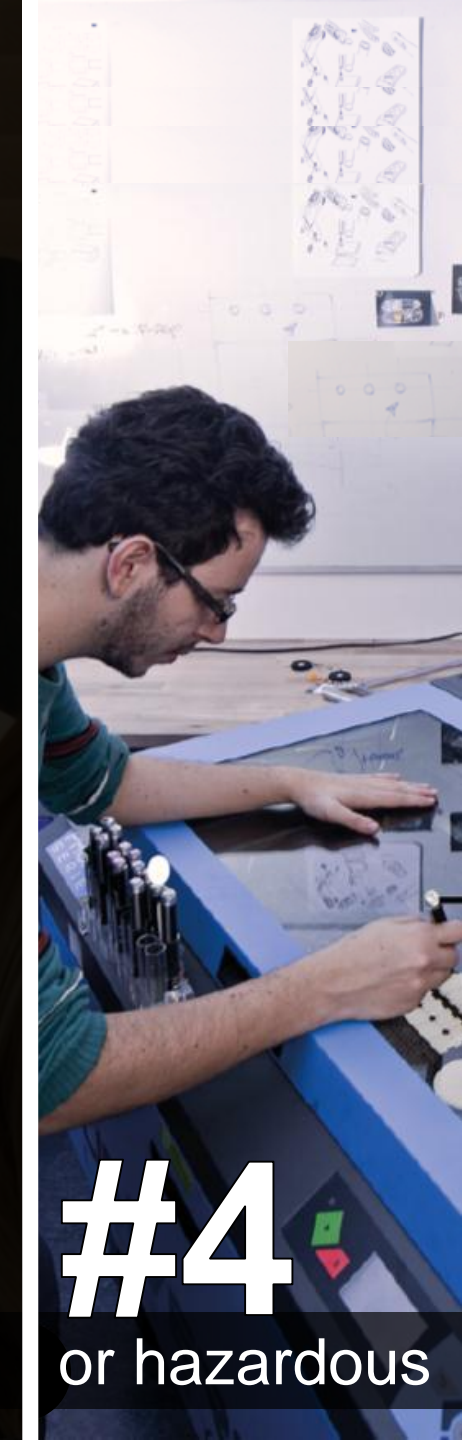
#2

on any object



#3

on screenless



#4

or hazardous



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



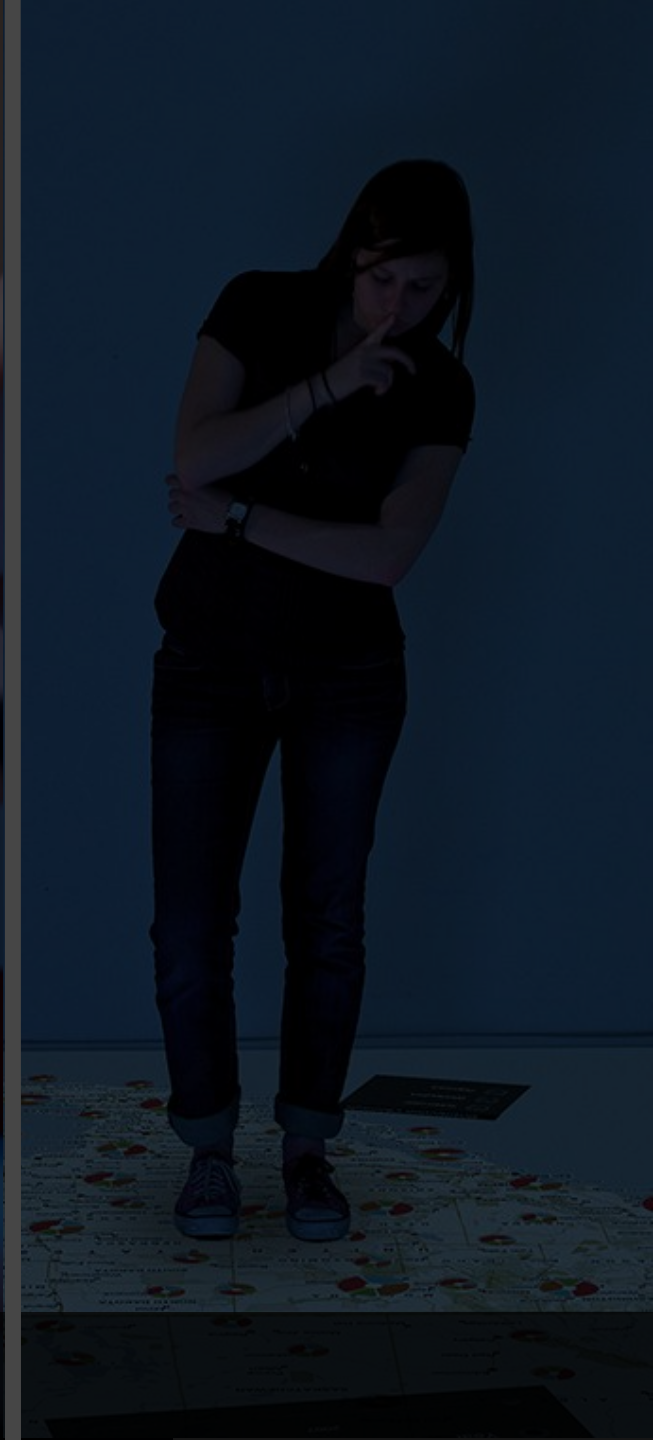
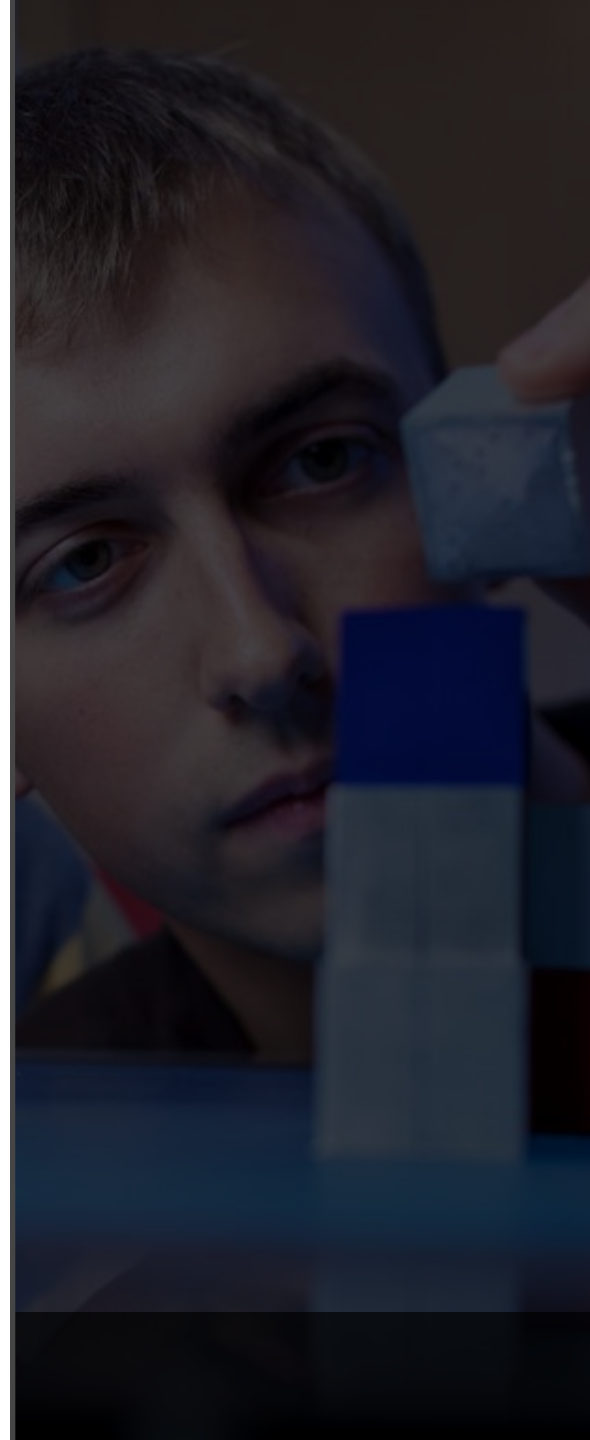
#2

lumino



#3

multitoe





super precise touch input











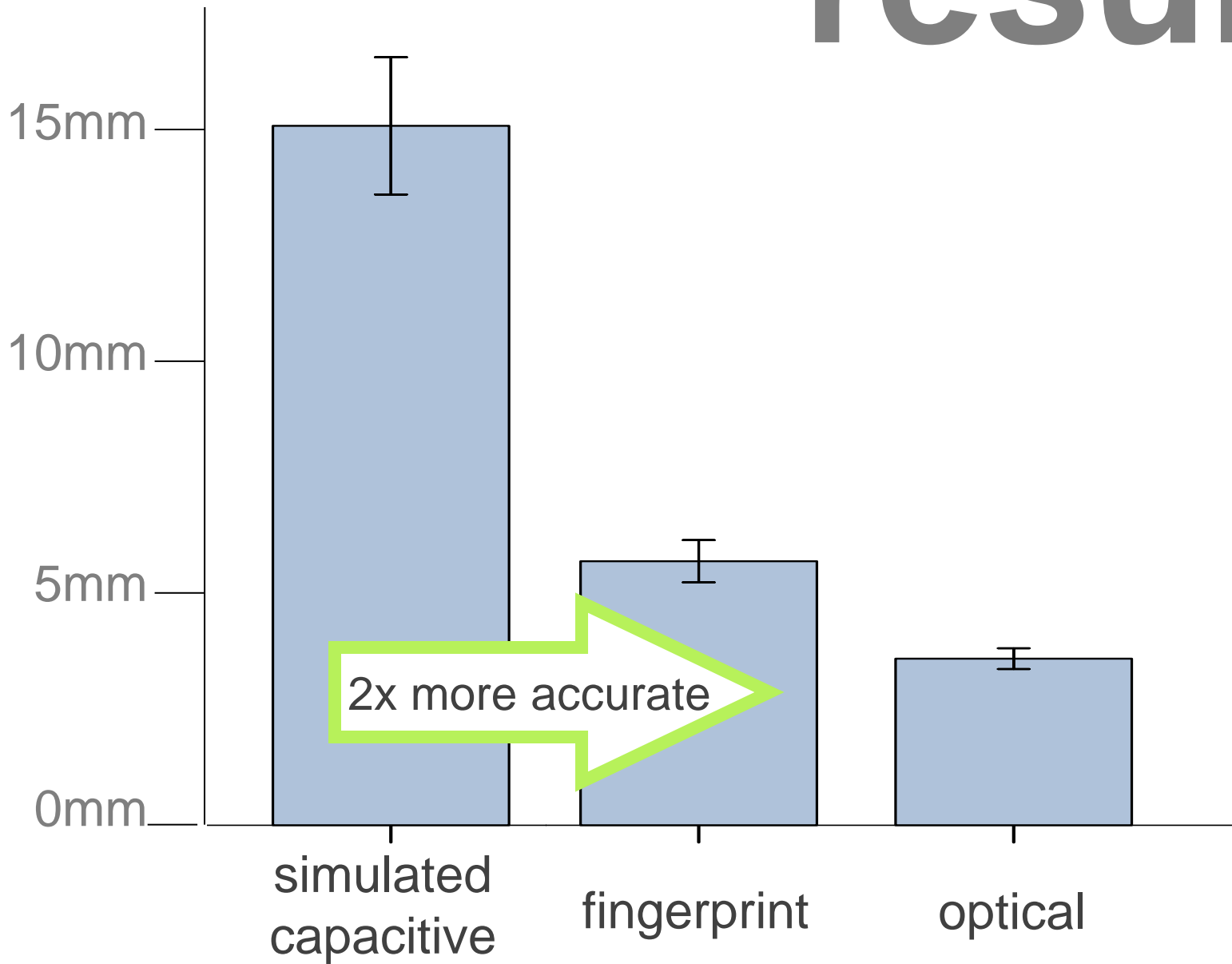
gets everything a traditional touchpad gets
but also **participantID and roll, pitch, and yaw**



GUARDIAN

results

minimum button size



2x more accurate

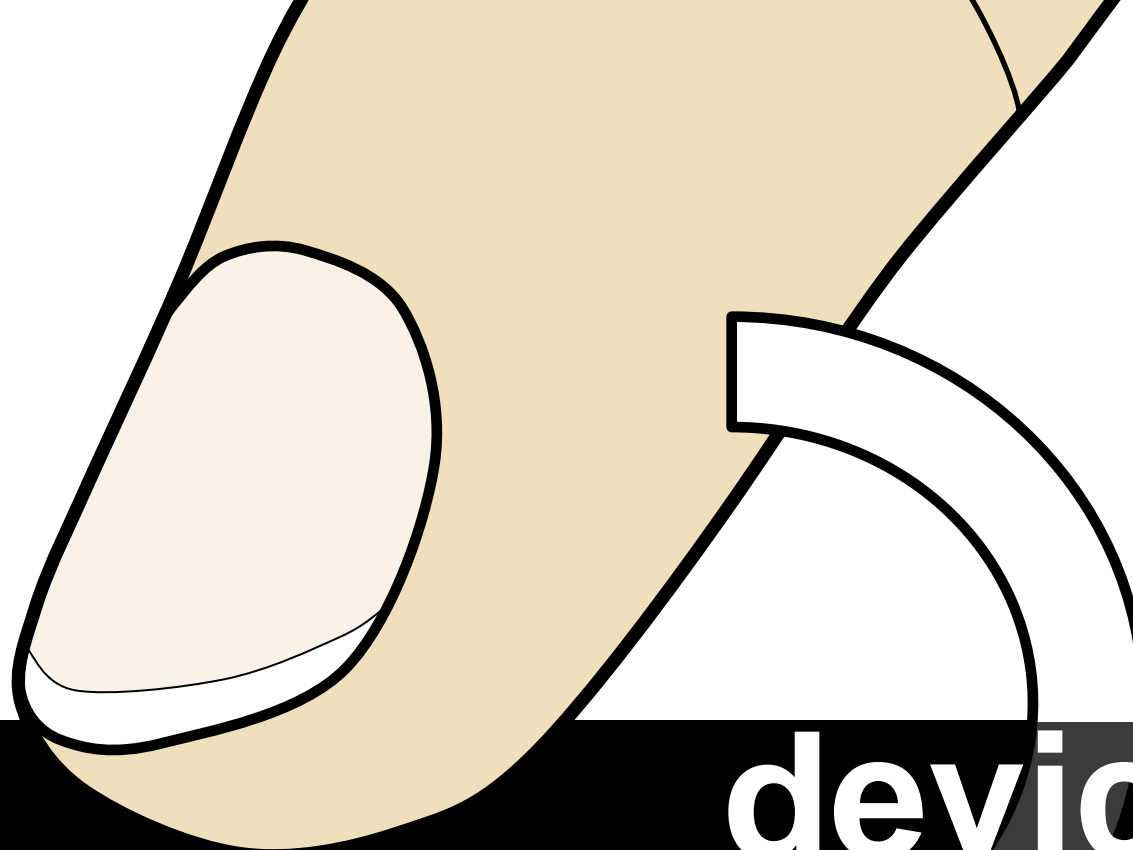
error bars are standard deviation

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

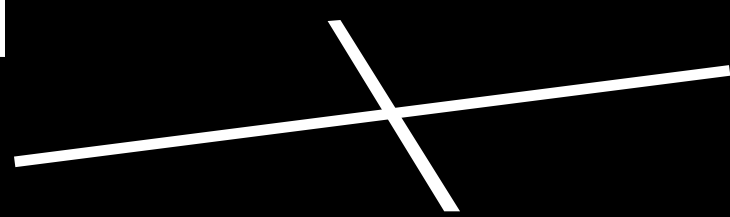
OD

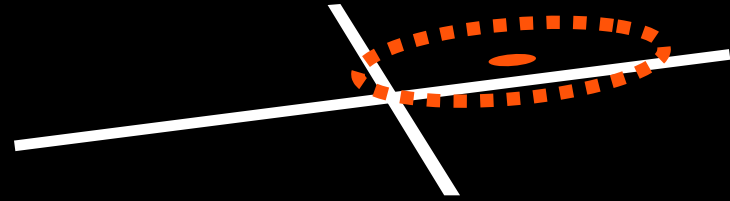
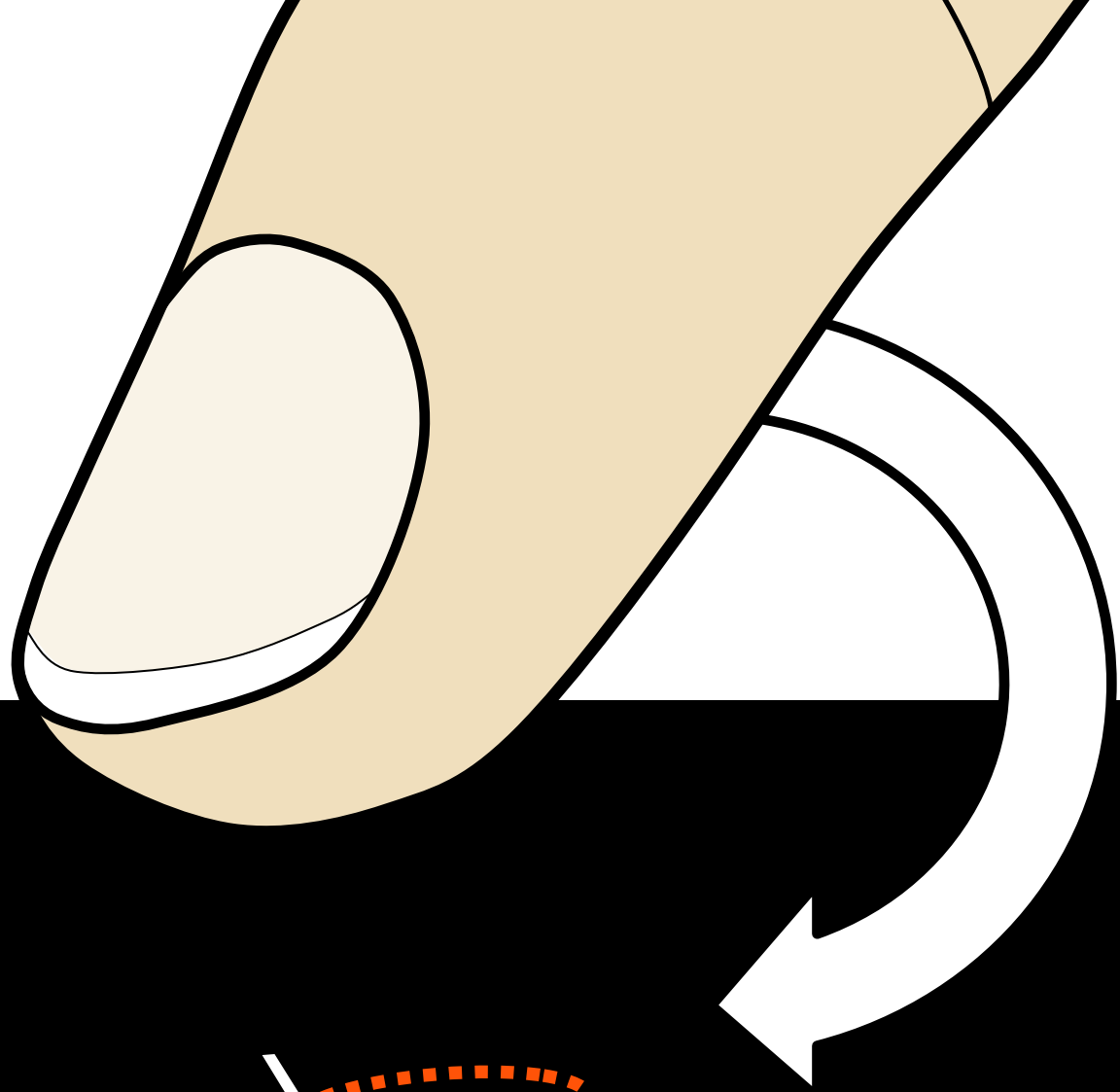
user

2D



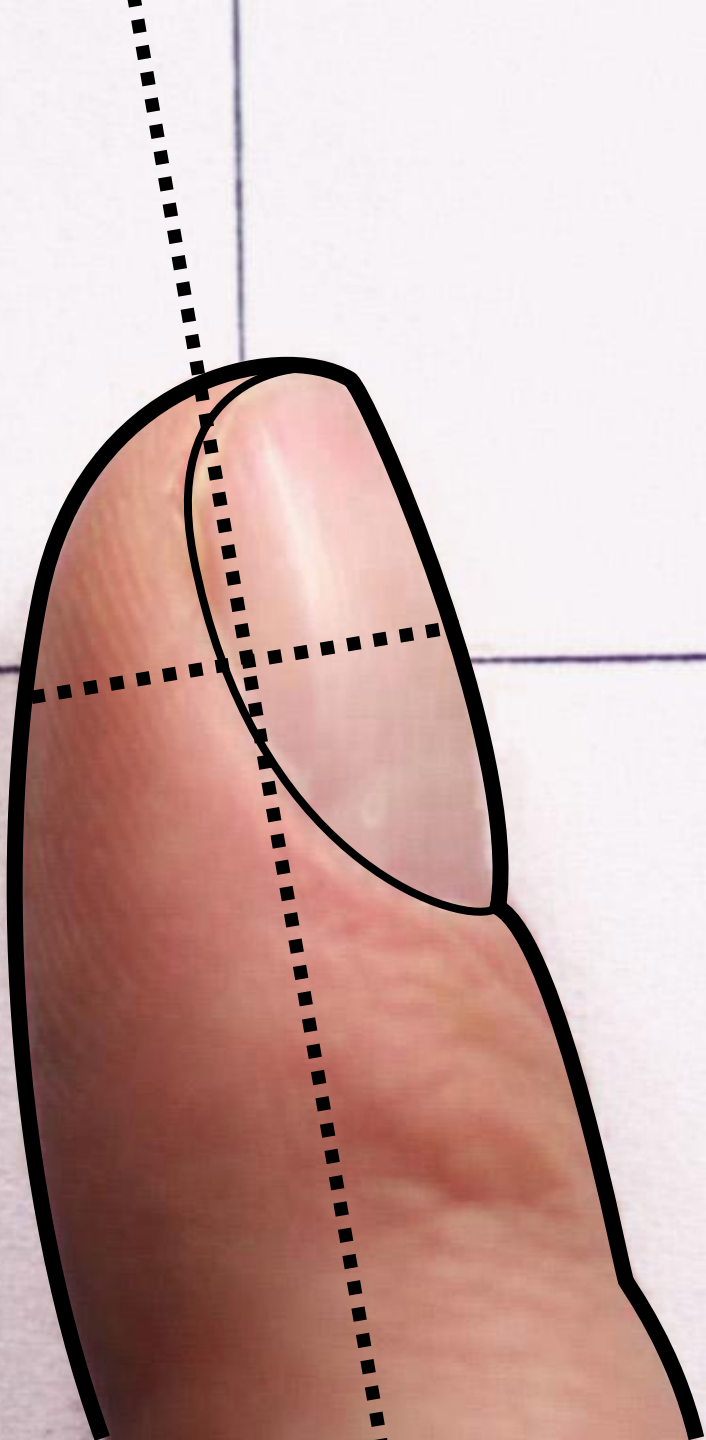
device





contact area

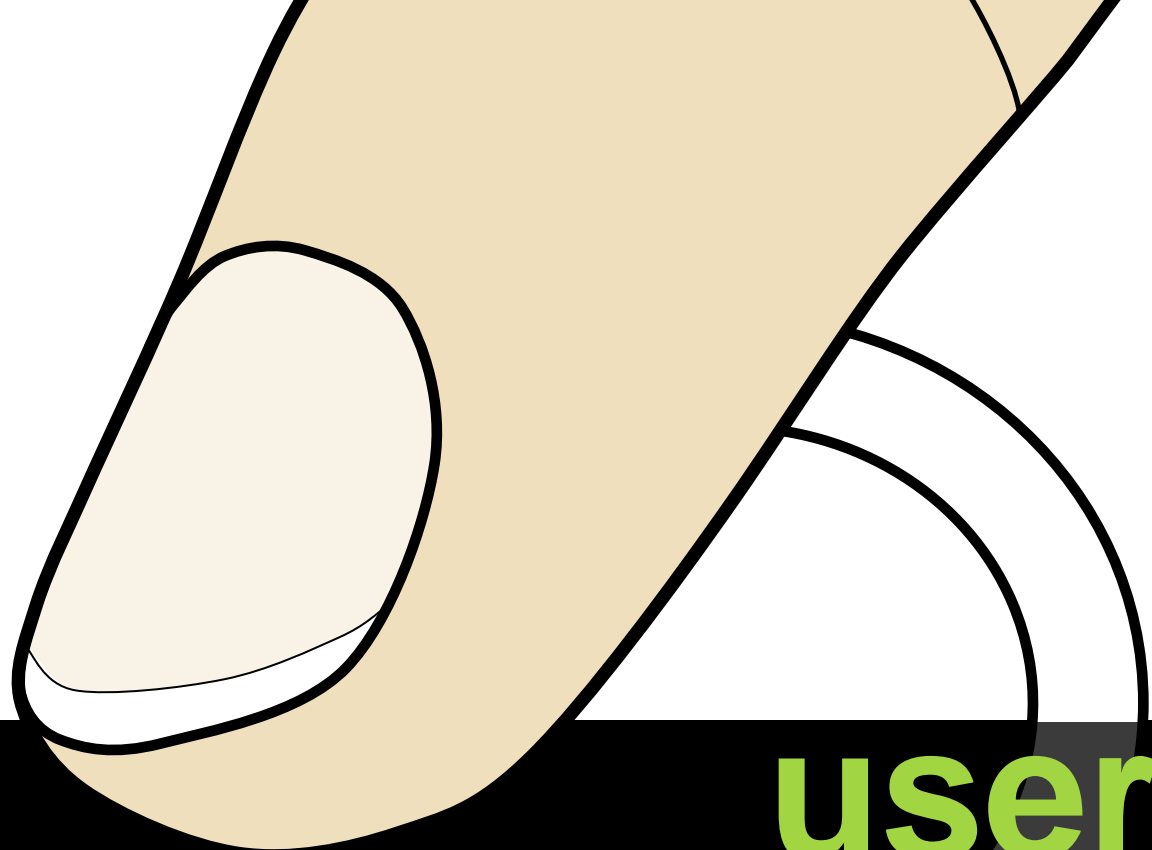




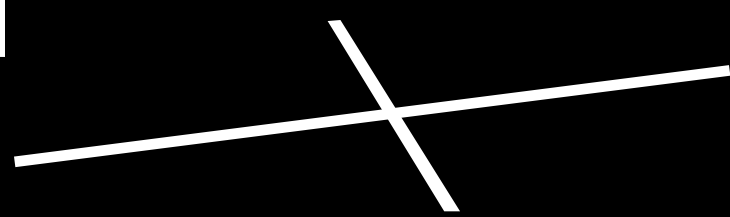
0D

user

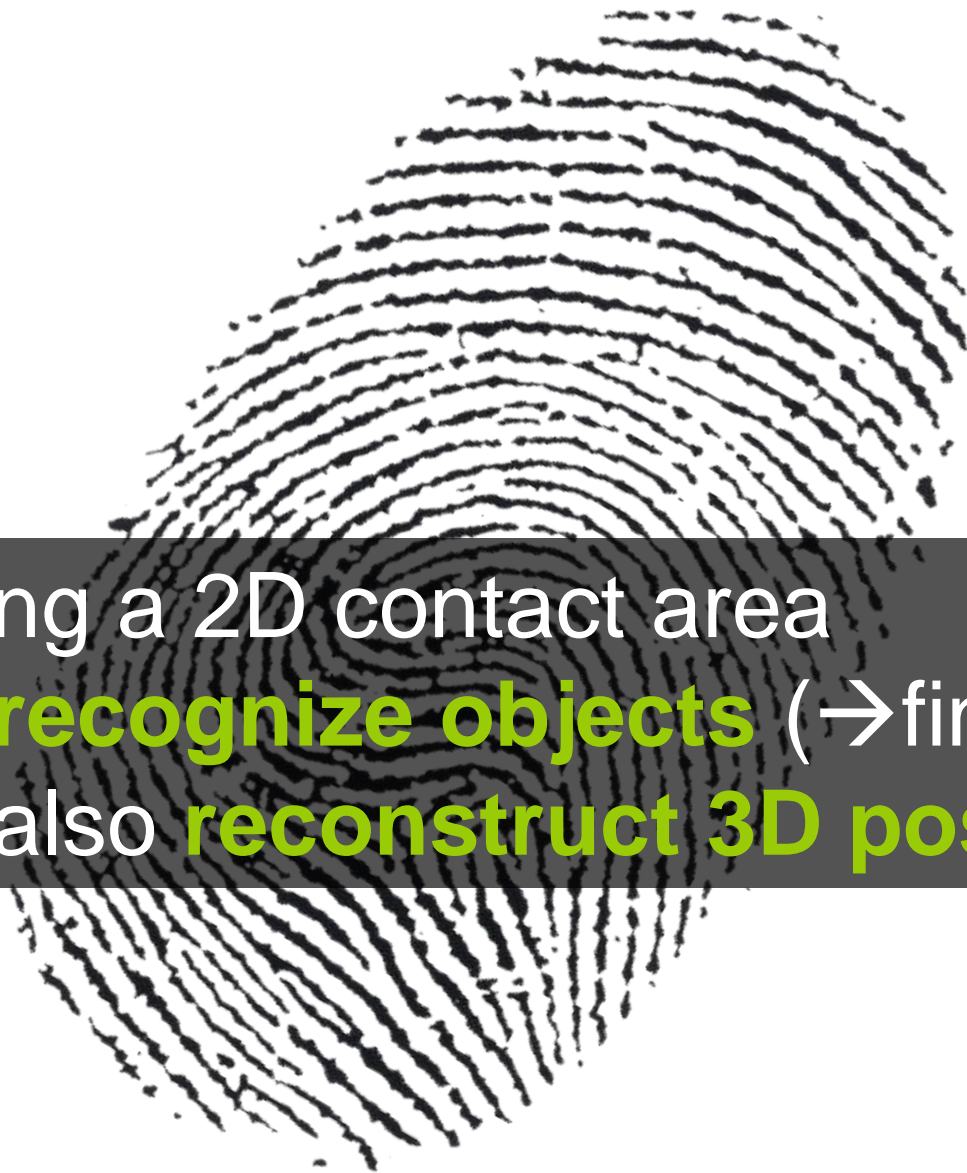
2D



user⁻¹



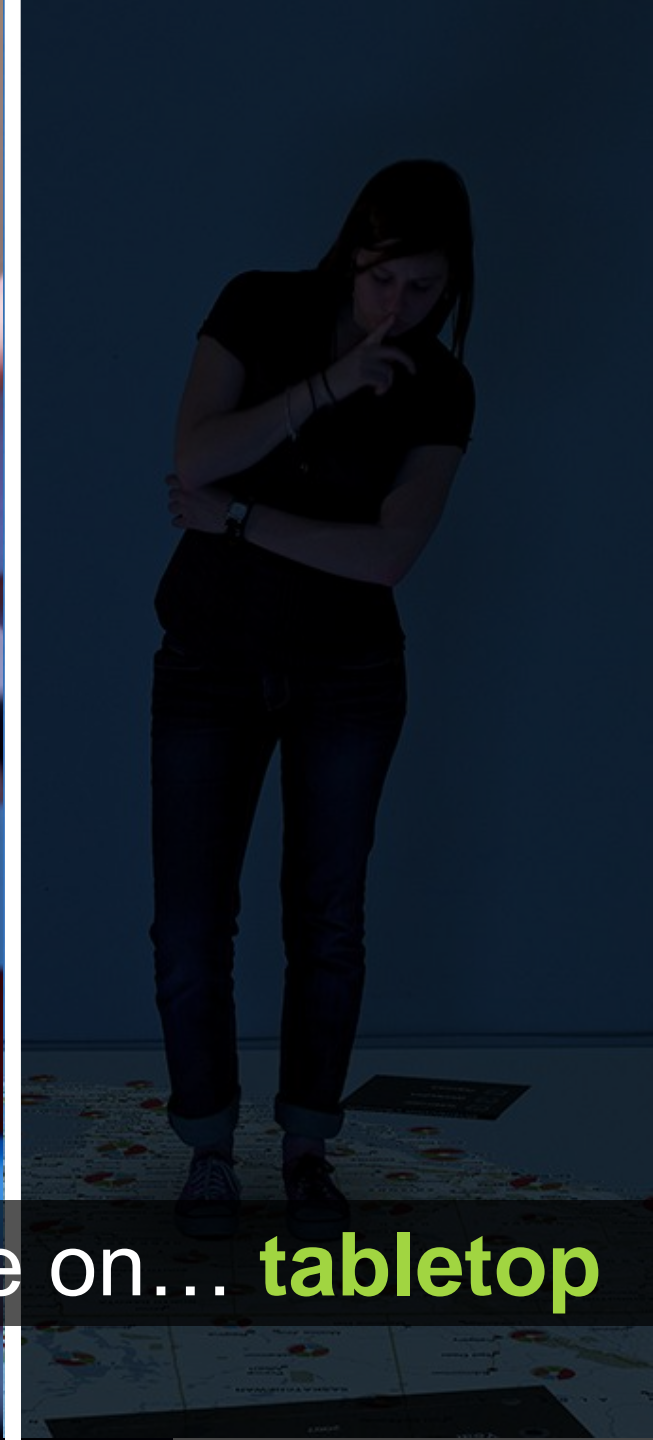
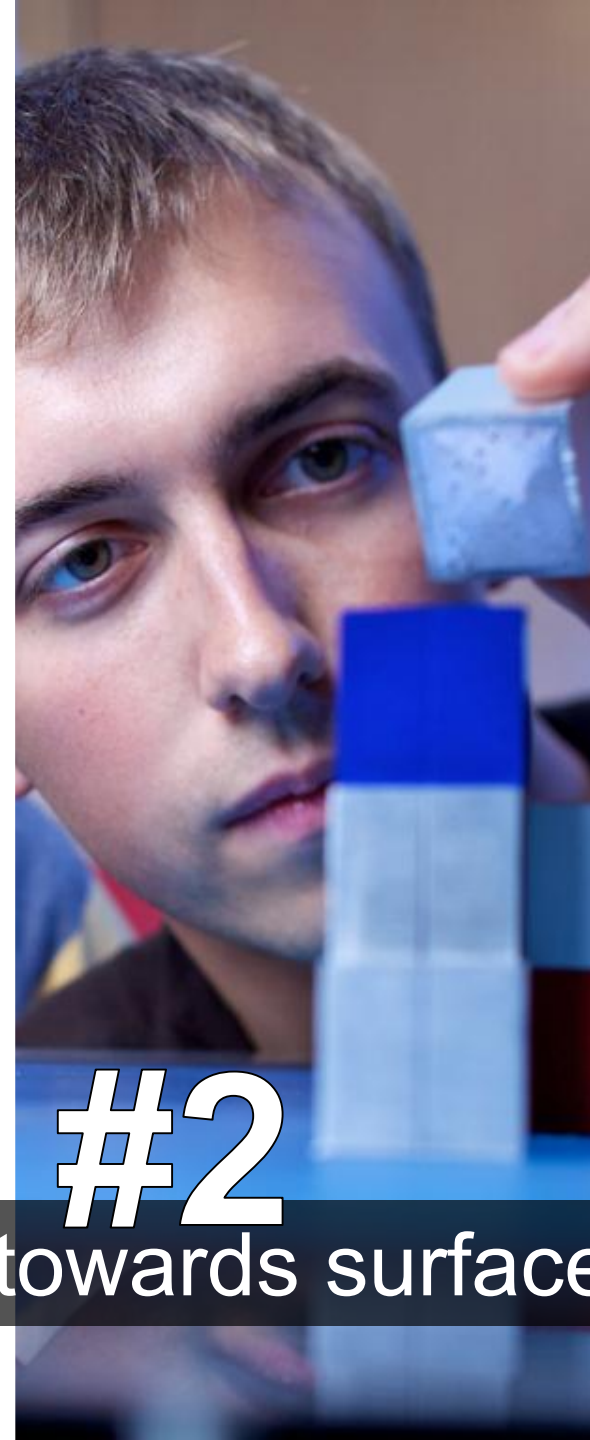
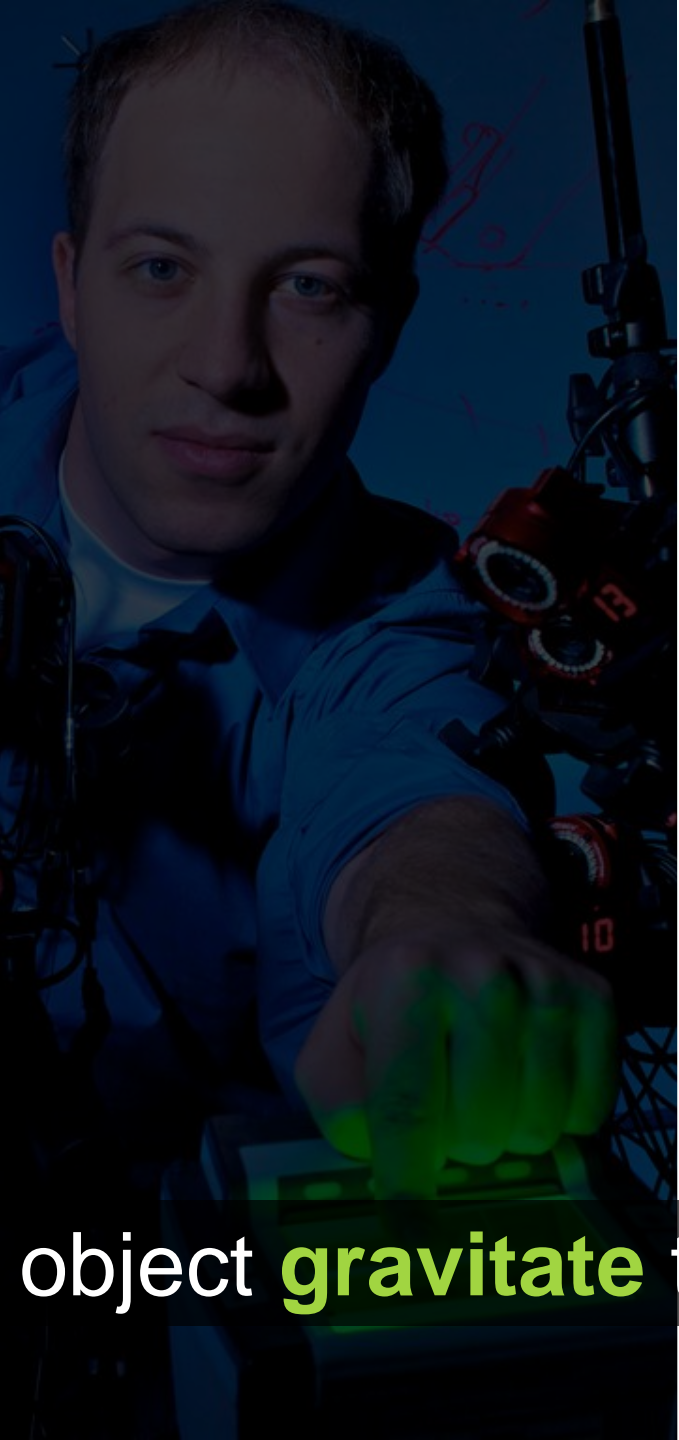
when we were done,
ridgepad had left us with **an idea:**



by observing a 2D contact area

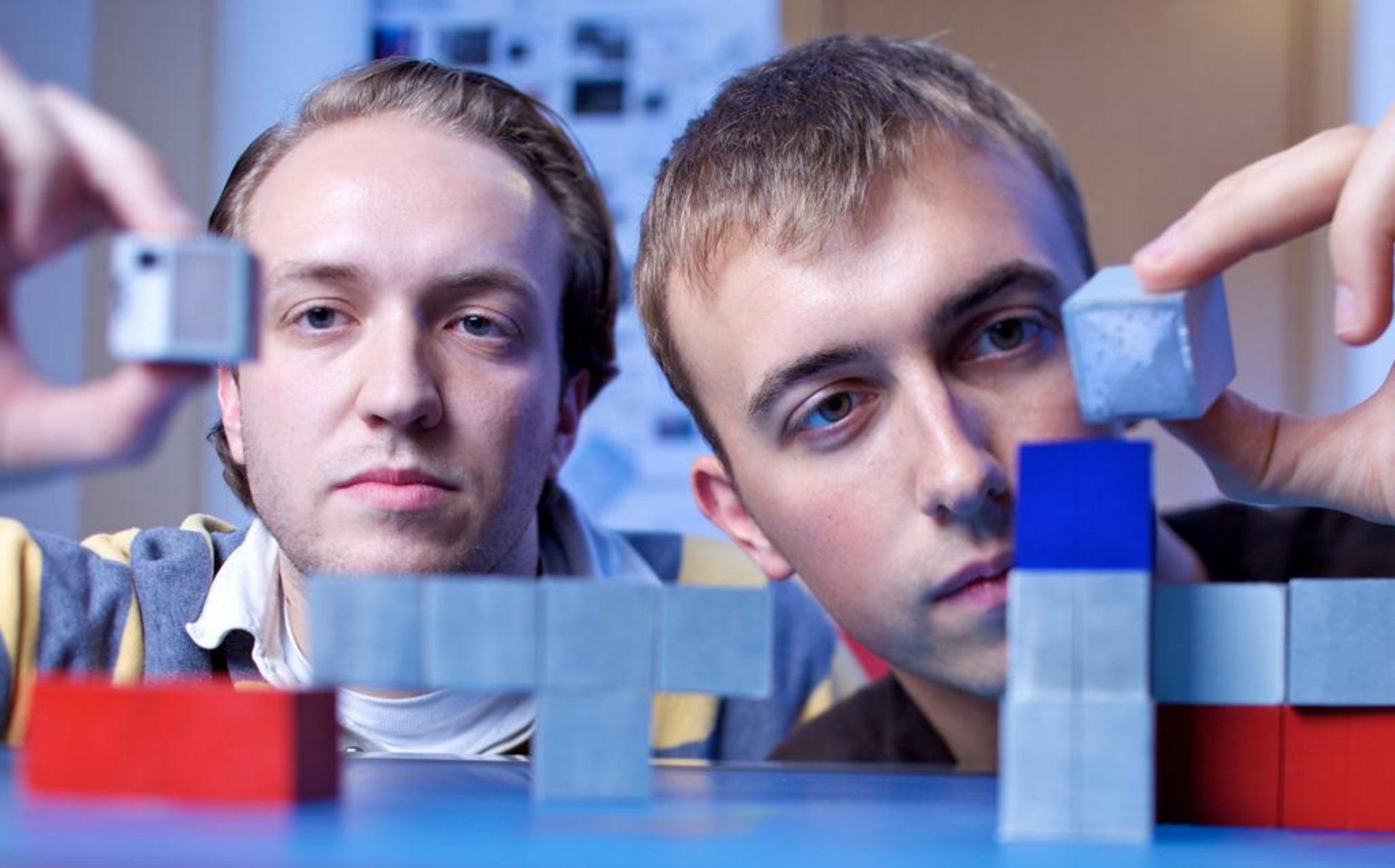
1. we can **recognize objects** (→fingerprint)
2. we can also **reconstruct 3D pose**

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

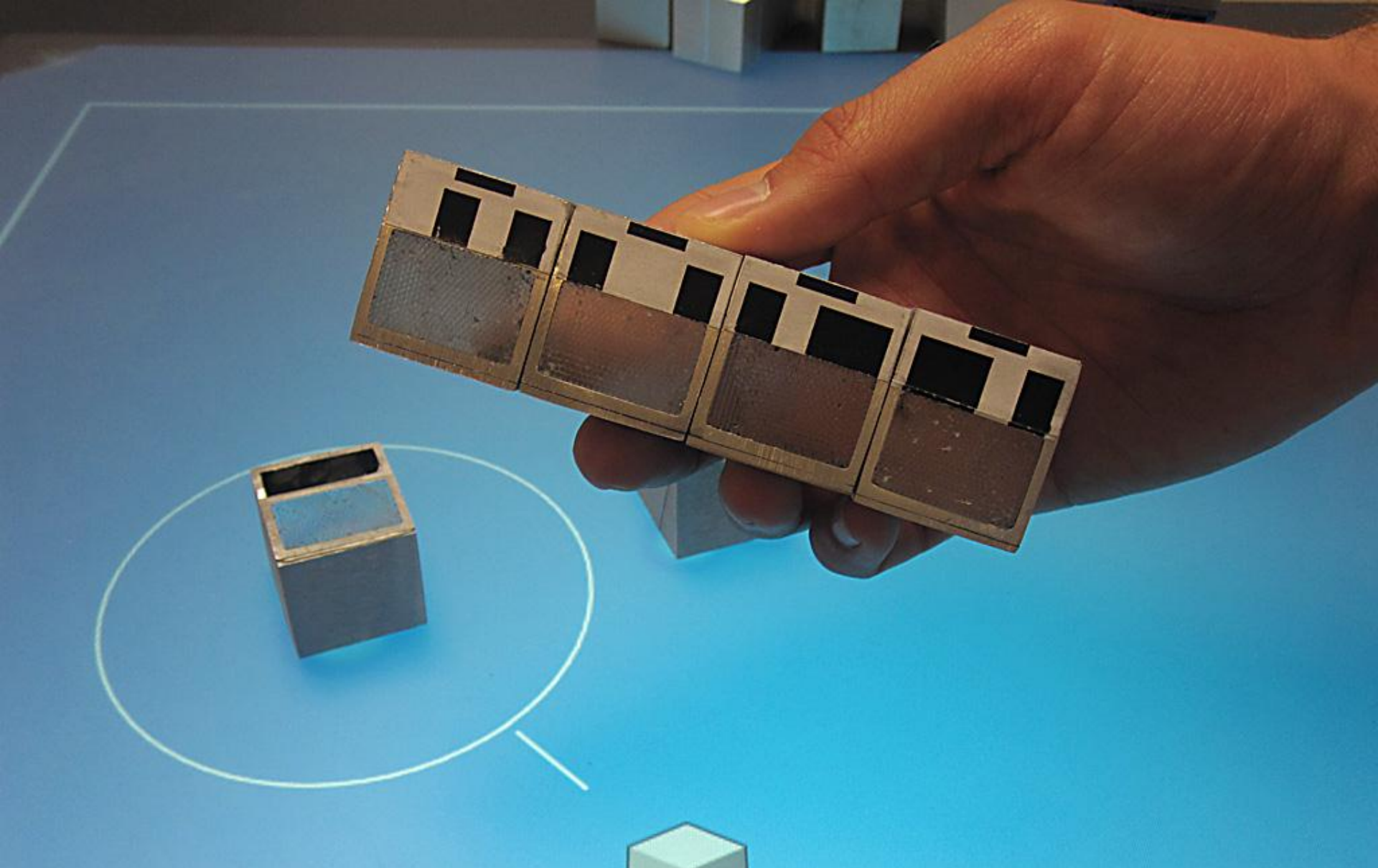


#2

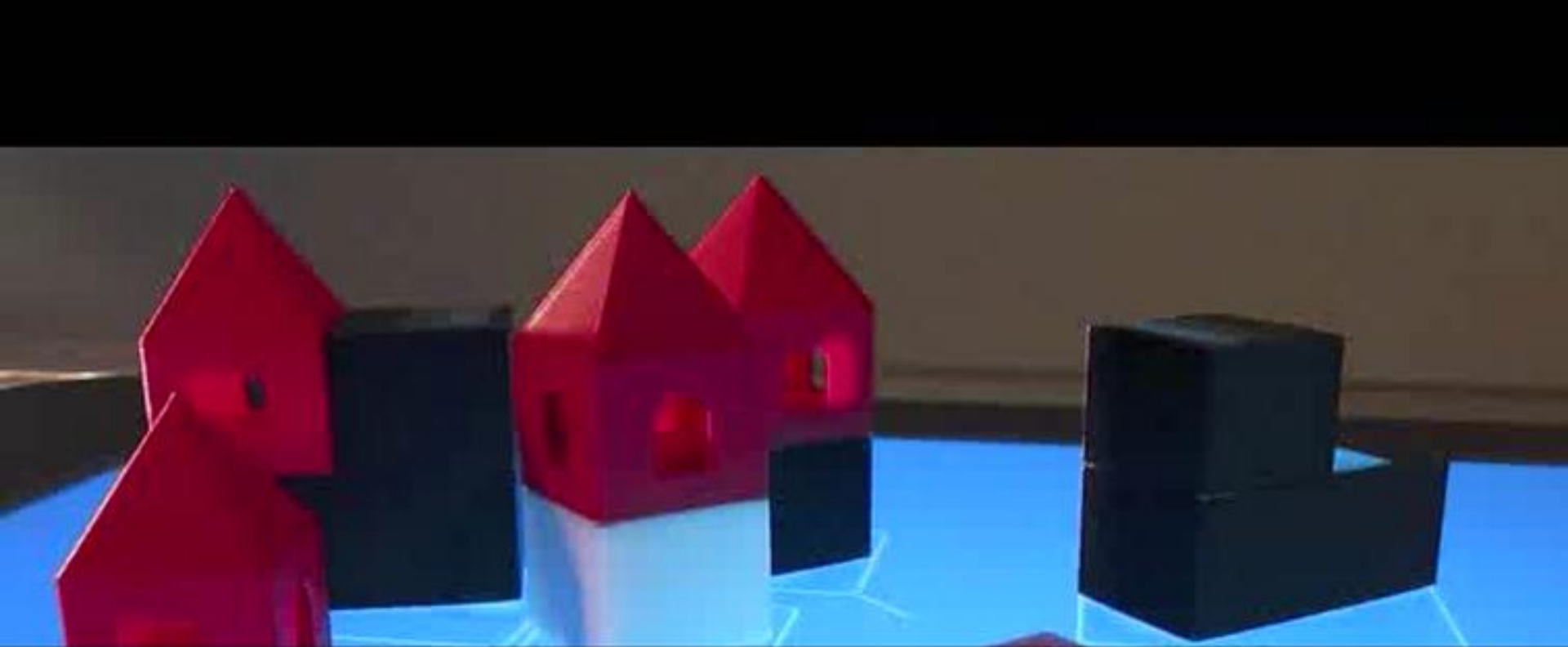
object **gravitate** towards surface on... **tabletop**



lumino



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



Lumino





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...**

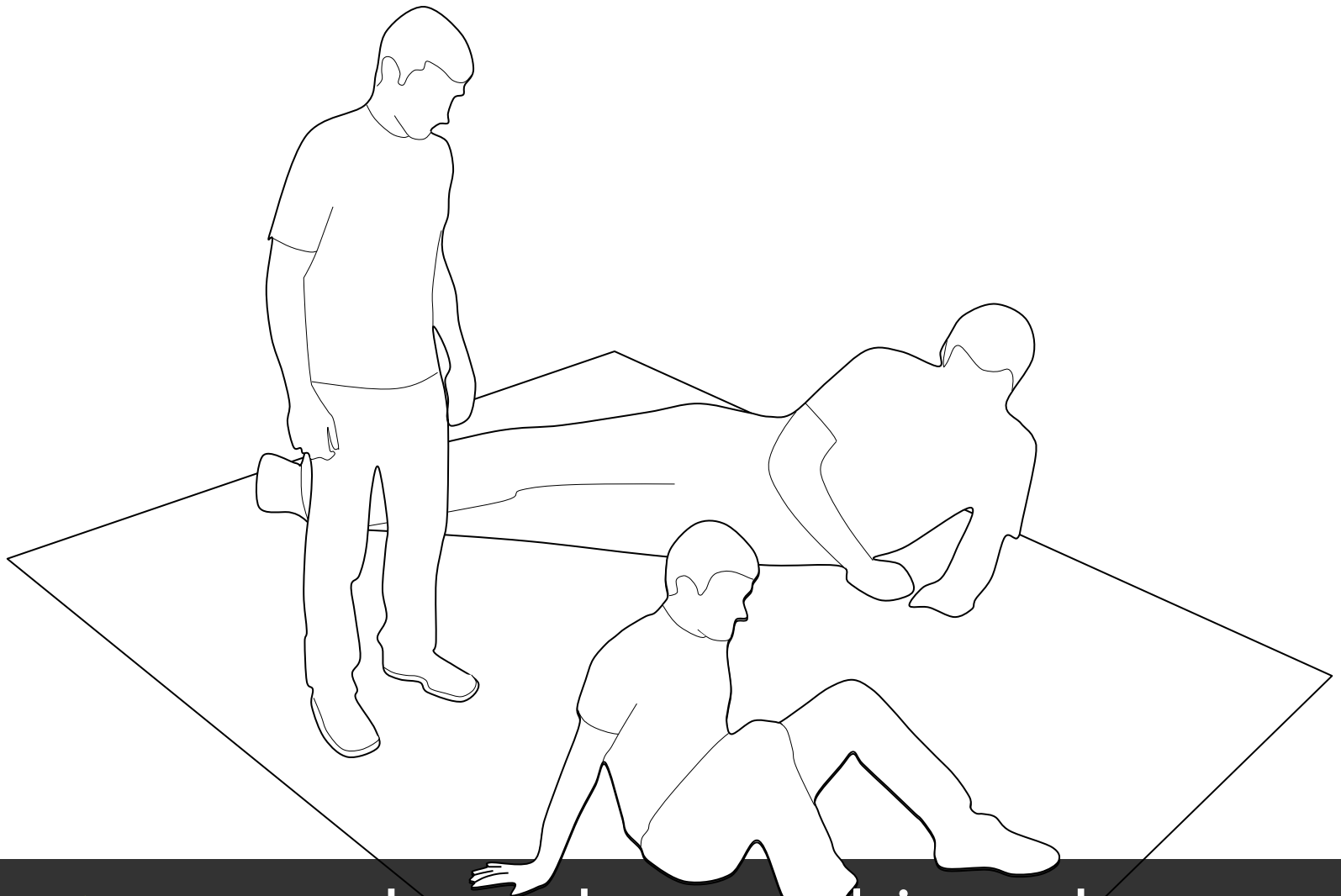


#3

>> multioe


head tracking got us inspired.

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



smart rooms based on multitouch...
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..





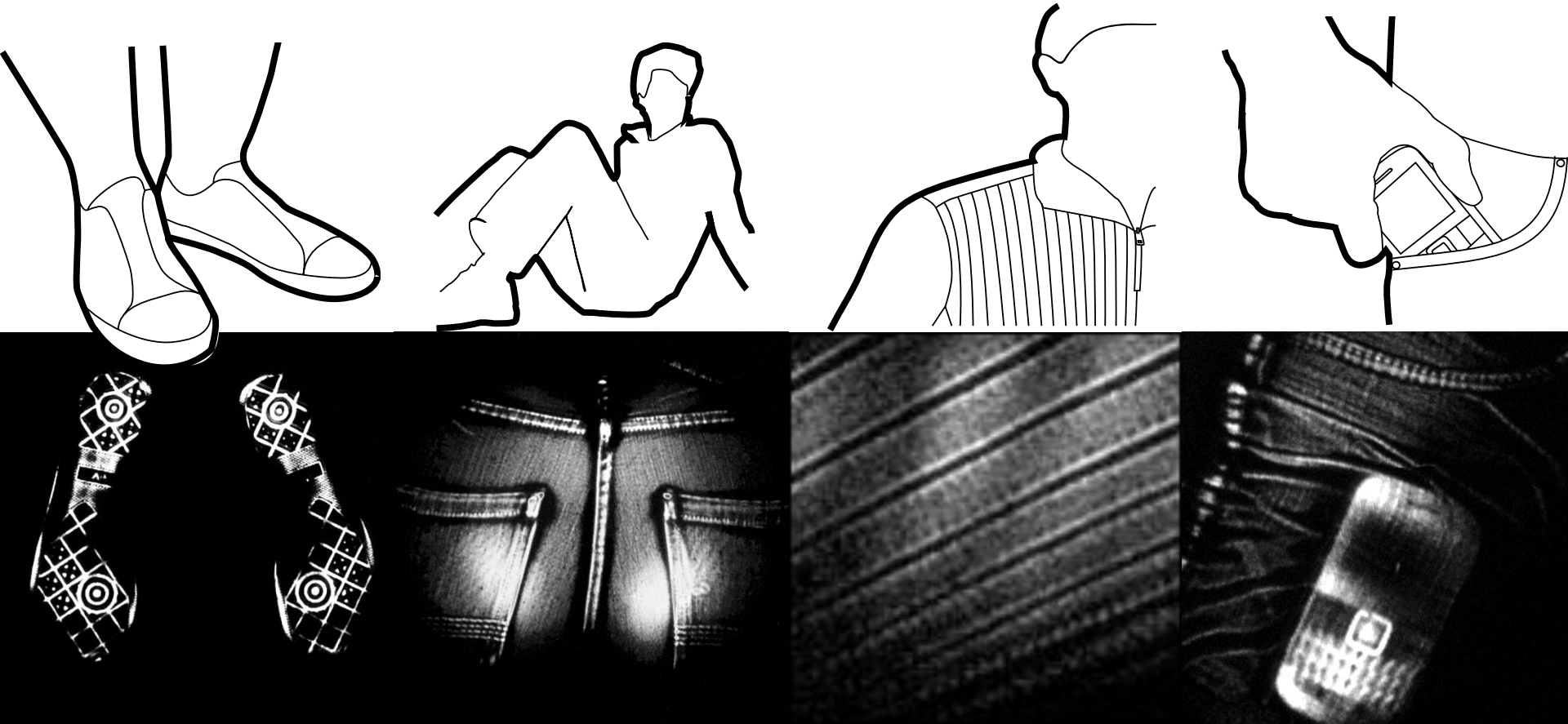
in the meantime: **8m² rear-projection**

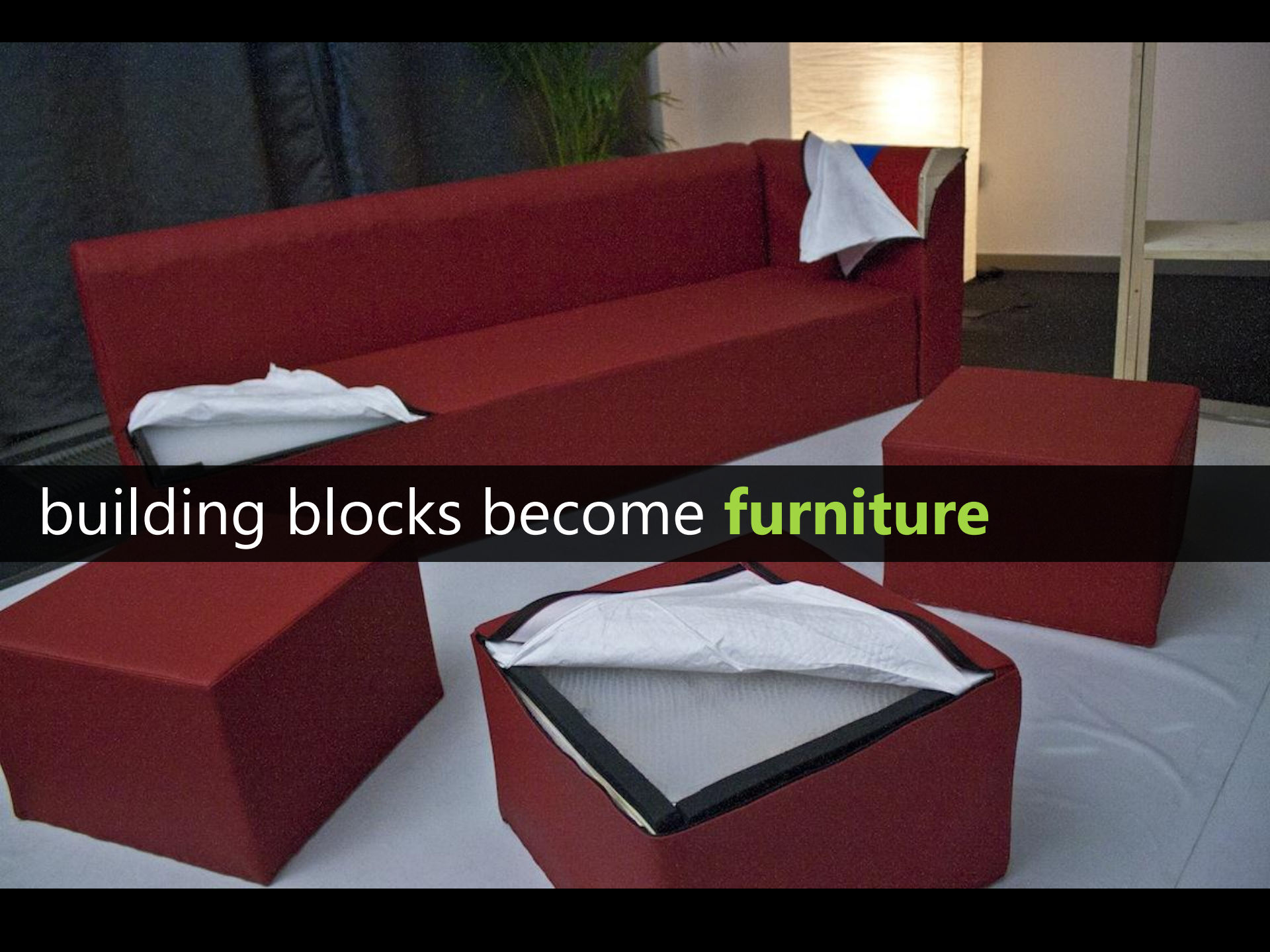


bringing the previous ideas together..



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





building blocks become **furniture**

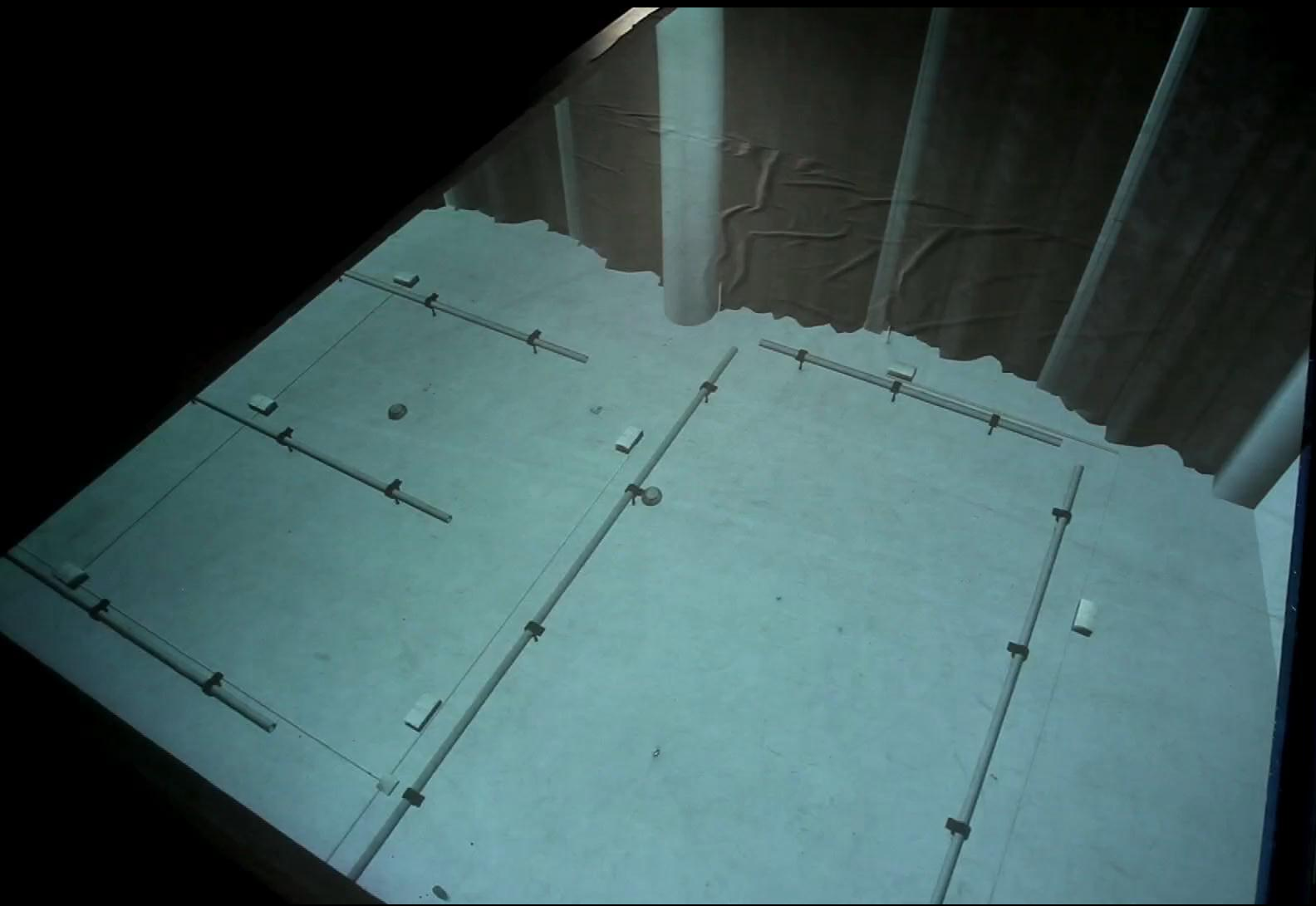












summary

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



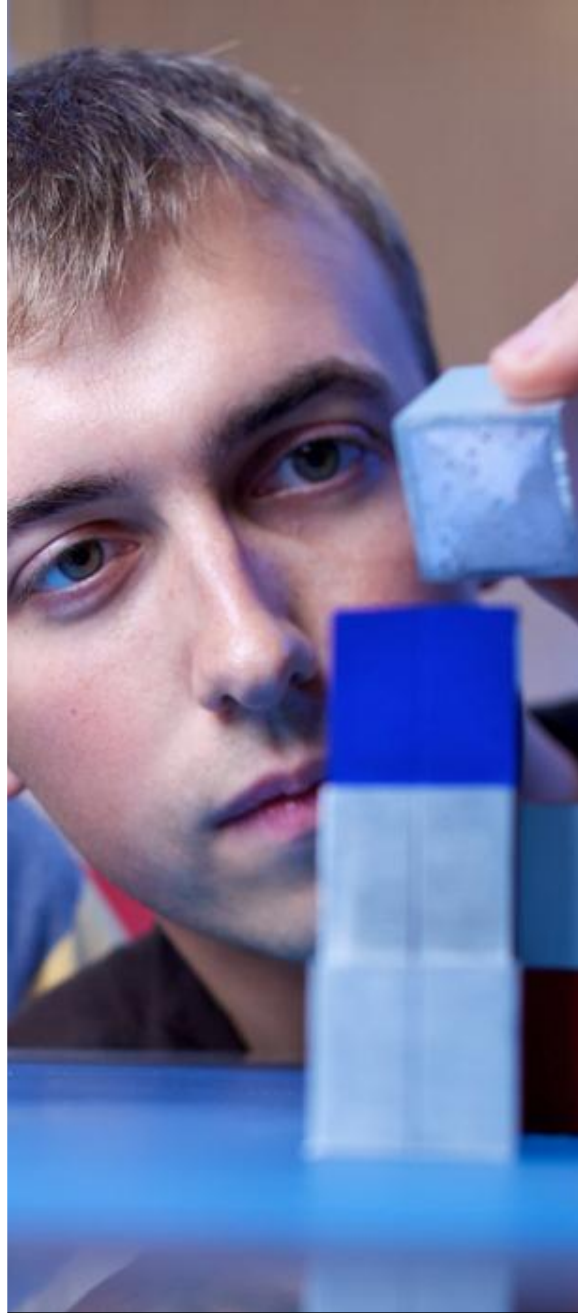
lumino



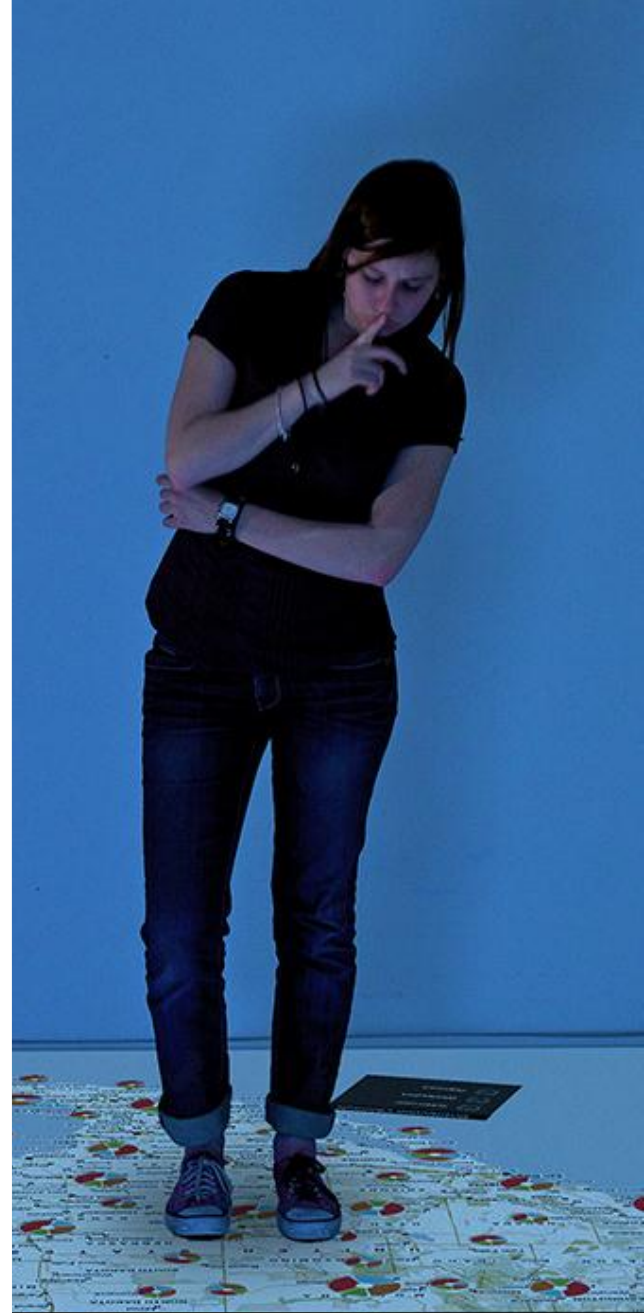
multitoe



CHI'10, CHI'11



CHI'10 best paper



UIST'11

supported by:

Microsoft®

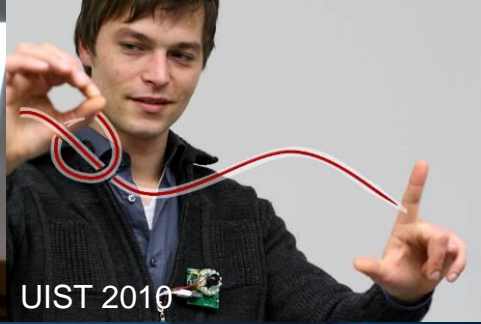
Research



CHI 2009--nominated



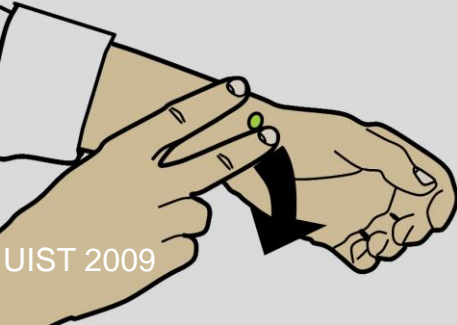
CHI 2010



UIST 2010



CHI 2011



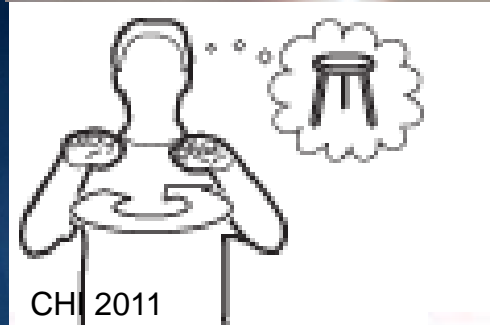
UIST 2009



CHI 2010

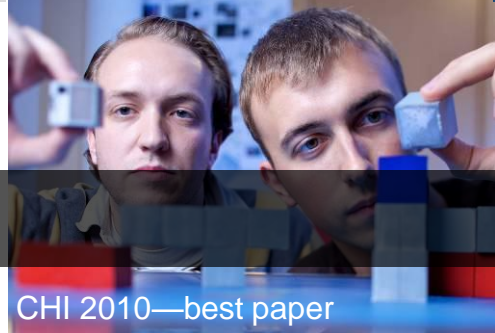


UIST 2010

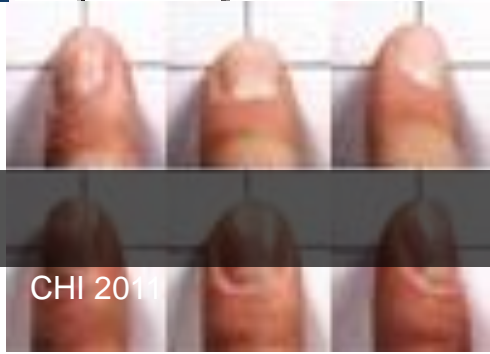


CHI 2011

questions?



CHI 2010—best paper



CHI 2011



done

open Ph.D./
post doc position



fachgebiet
human-computer interaction

HPI

Hasso
Plattner
Institut

IT Systems Engineering | Universität Potsdam

KANN MAN INNOVATION LERNEN?

bei IT-Gurus im Gespräch
mit Design Thinking



**enabling
a vision...**





1:n
1960s

1:1
1980s

m:1
2000s



1::mobile ←

2::smart rooms ←

m:1
ubicomp

add photo
of flower power

we left the 60s...

add photo
of Top Gun Tom cruise

...to enter the 80s