

The End of Reality: The New Augmented Reality

Alex Olwal

Jamie Zigelbaum

#EndOfReal
#MLSXSW

Feedback on the talk:
<http://sxsw.tv/d7b>

HE STRIPPED SOULS AS BARE AS BODIES!

AMERICAN INTERNATIONAL presents

RAY MILLAND

STARRING AS

“X”

**THE MAN WITH
THE X-RAY EYES**

IN **PATHÉCOLOR**
AND **SPECTARAMA**

WINNER OF THE
INTERNATIONAL SCIENCE-FICTION
FILM FESTIVAL



CO-STARRING **DIANA van der VLIS · HAROLD J. STONE · JOHN HOYT and DON RICKLES**

Produced and Directed by
ROGER CORMAN

Screenplay by
ROBERT DILLON · RAY RUSSELL

Story by
RAY RUSSELL

Executive Producers:
JAMES H. NICHOLSON

and
SAMUEL Z. ARKOFF

Music by
LES BAXTER

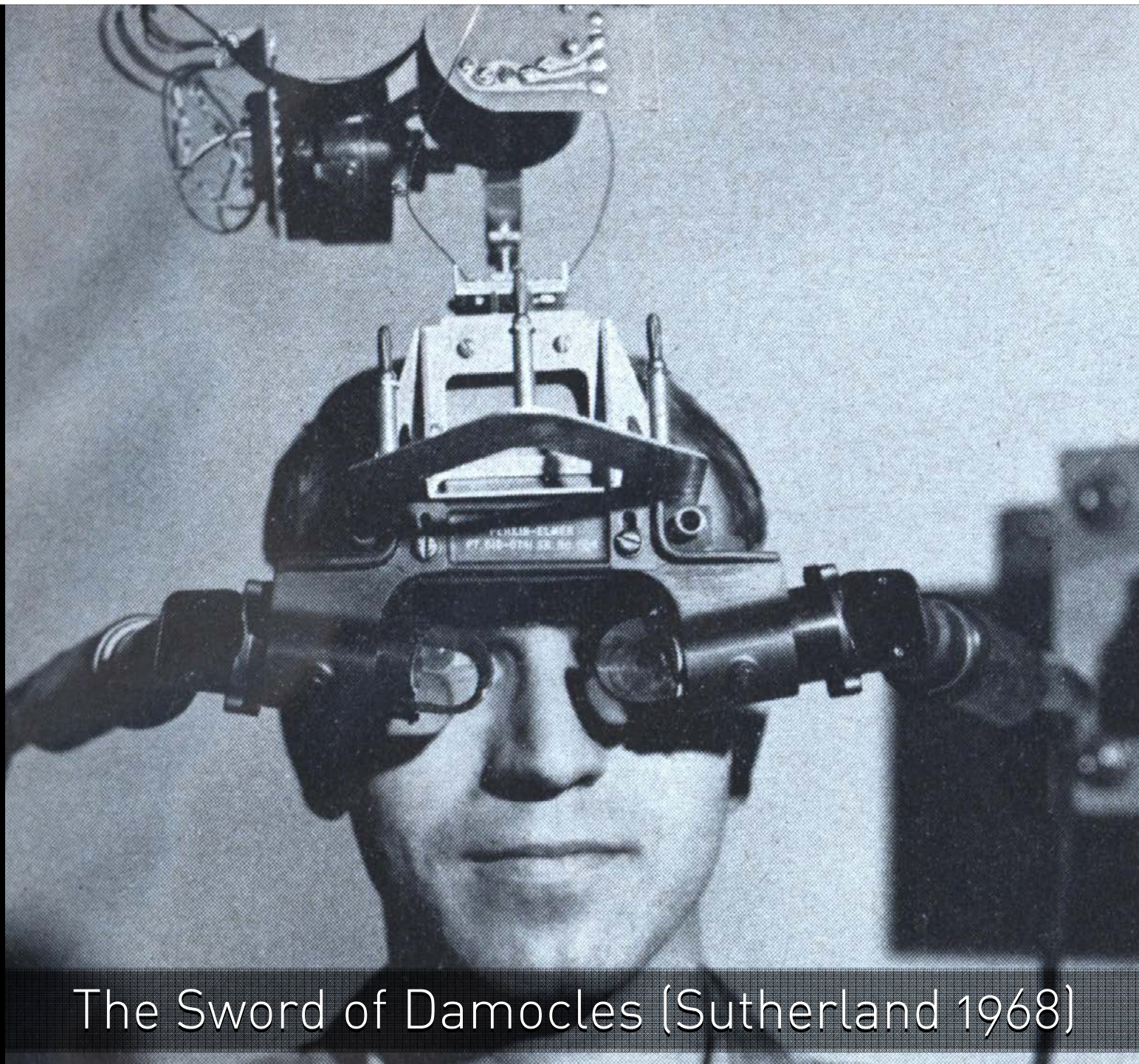
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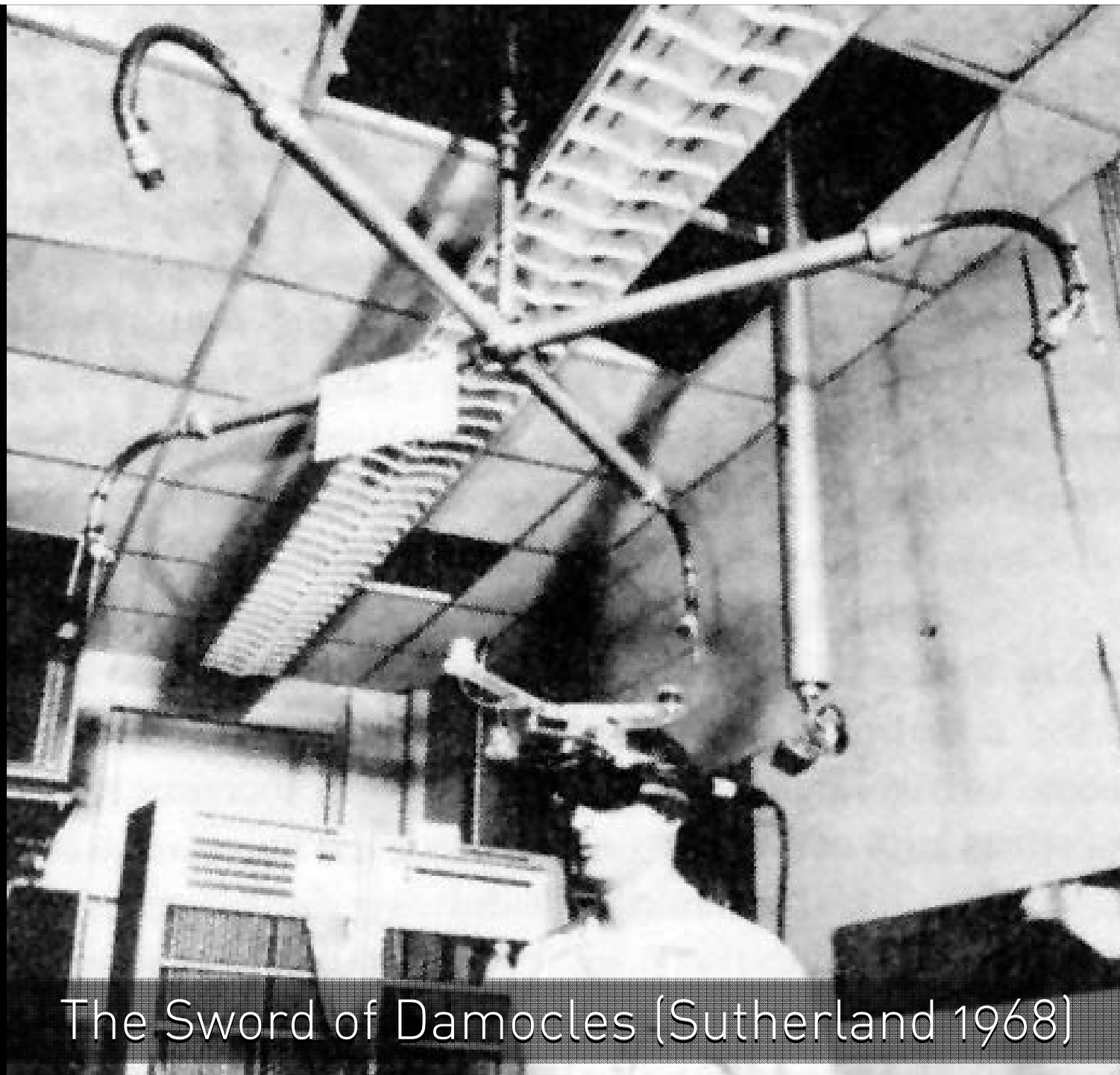
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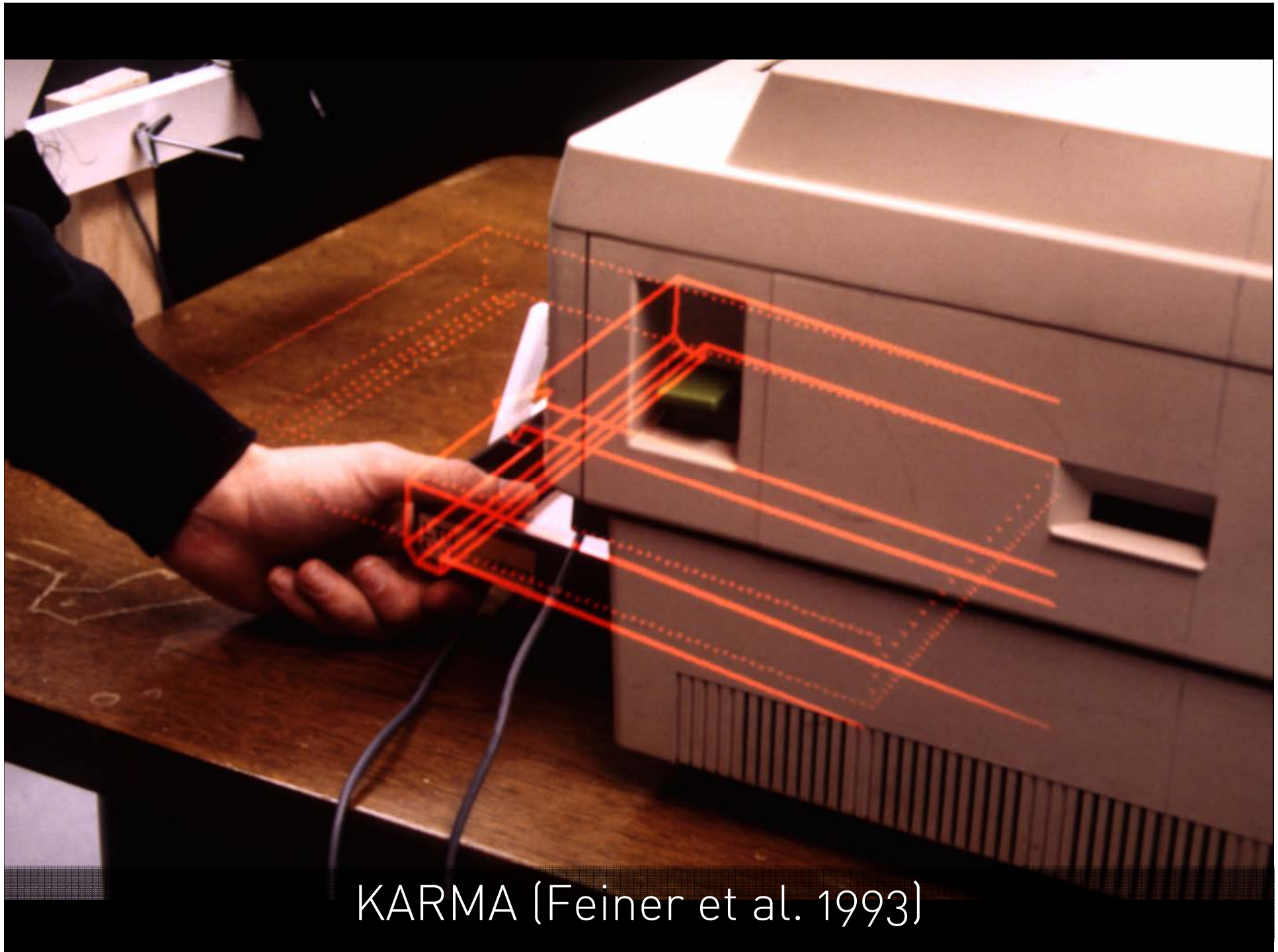


Seamlessly enhancing the senses.





The Sword of Damocles (Sutherland 1968)



KARMA (Feiner et al. 1993)

Head-worn



Ivan Sutherland 1968



5dt HMD



Nomad



ProView XL40/50 STm



AddVisor 150

Head-worn



Handheld, Situated & Hybrid



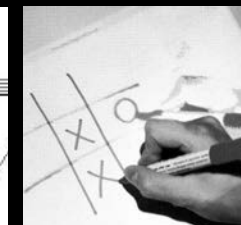
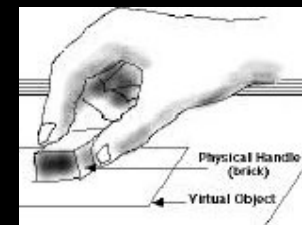
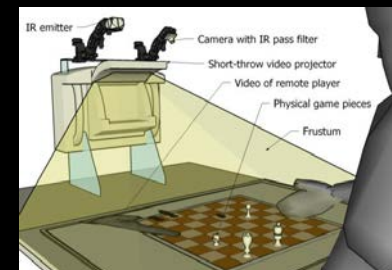
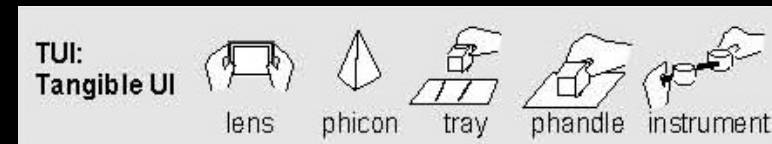
Everywhere Displays [Pinhanez et al. 2001], iLamp Projectors [Raskar et al. 2003],
On-board Mixed Reality Projector [Karitsuka & Sato 2003], Transflective Surfaces [Bimber et al. 2000],
Cell phone [Möhring & Bimber 2004], NaviCam [Rekimoto 1997], PDA [Wagner & Schmalstieg 2003]



Digital Desk (Wellner 1993)

Interactive Surfaces & Tangible UIs

- Display 2D graphics
- Sense on & above surface
- Detect & augment objects



DigitalDesk [Wellner 1993]
Tangible Bits [Ullmer & Ishii & Buxton 1997]
Augmented Surfaces [Rekimoto & Saitoh 1999]
PlayAnywhere / PlayTogether [Wilson 2005 / Wilson & Robbins 2006]



Ubiquitous Computing

Weiser 1991

Ubiquitous

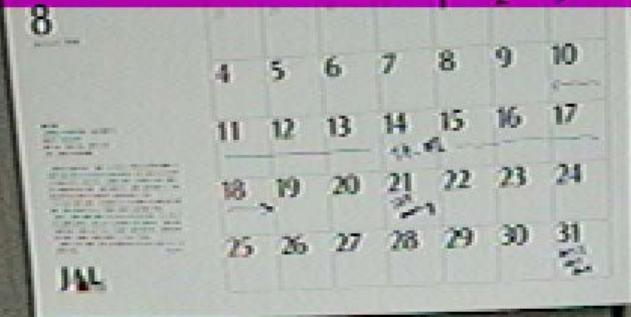
- Displays
- Sensing
- Connectivity



Devices

- Tabs, pads & boards

Tue Aug 20 17:05:04 1996
1:00PM – 3:00PM Weekly Meeting
3:30PM – 10:00PM Shoot a Video



NaviCam

601



Navicam (Rekimoto 1995)

Spatially Aware Displays

- Tracked display
- Focus + context



Chameleon [Fitzmaurice 1993]

NaviCam [Rekimoto 1995]

Augmented Notebook [Mackay et al. 2002]

Focus + Context displays [Baudisch et al. 2002]

VITA [Benko et al. 2004]

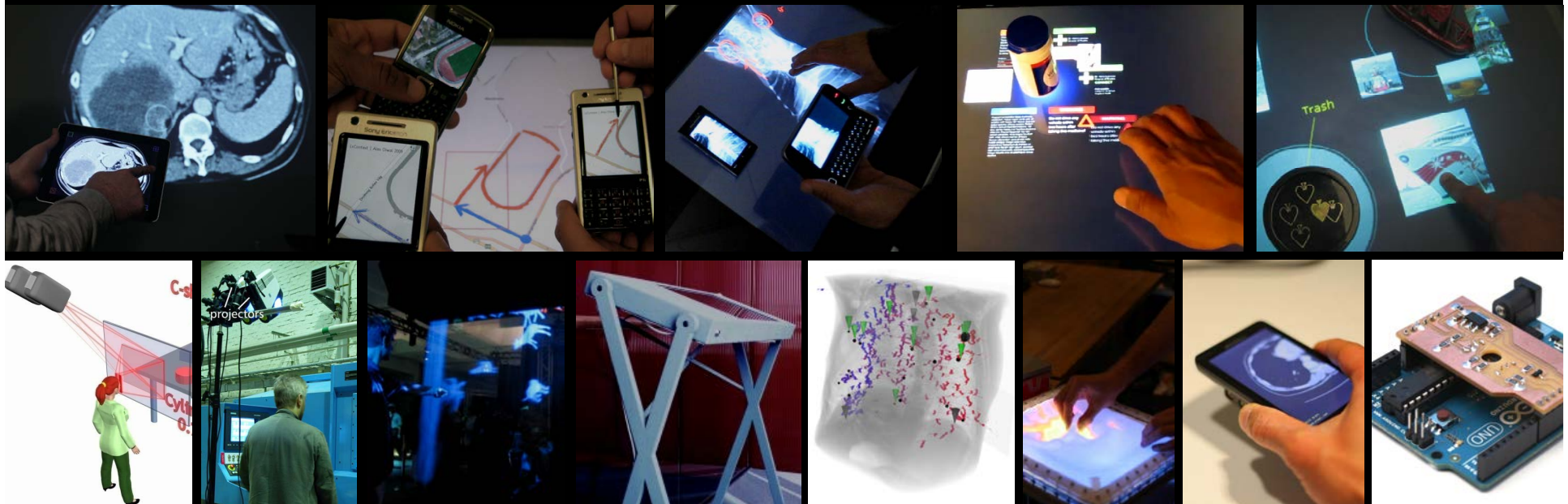
Ubiquitous graphics [Sanneblad & Holmquist 2006]

Alex Olwal, Ph.D.
www.olwal.com



Human — computer interaction

- Interaction techniques & technologies
- Augmented reality
- Medical & health applications



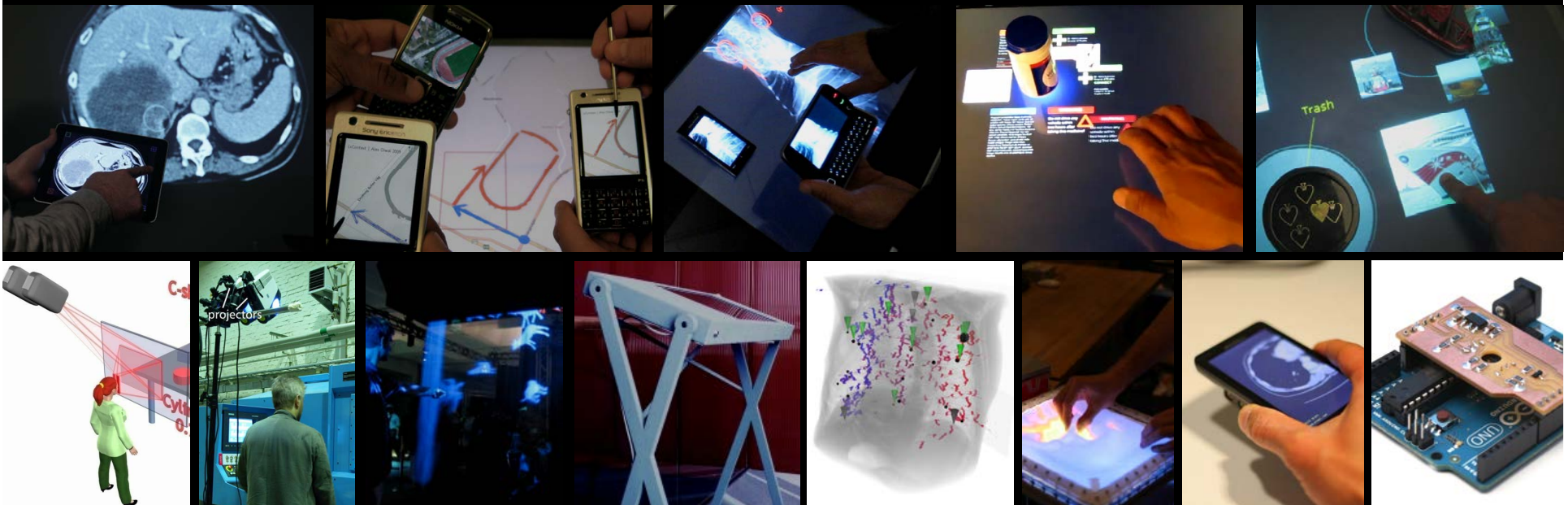
Alex Olwal, Ph.D.

www.olwal.com



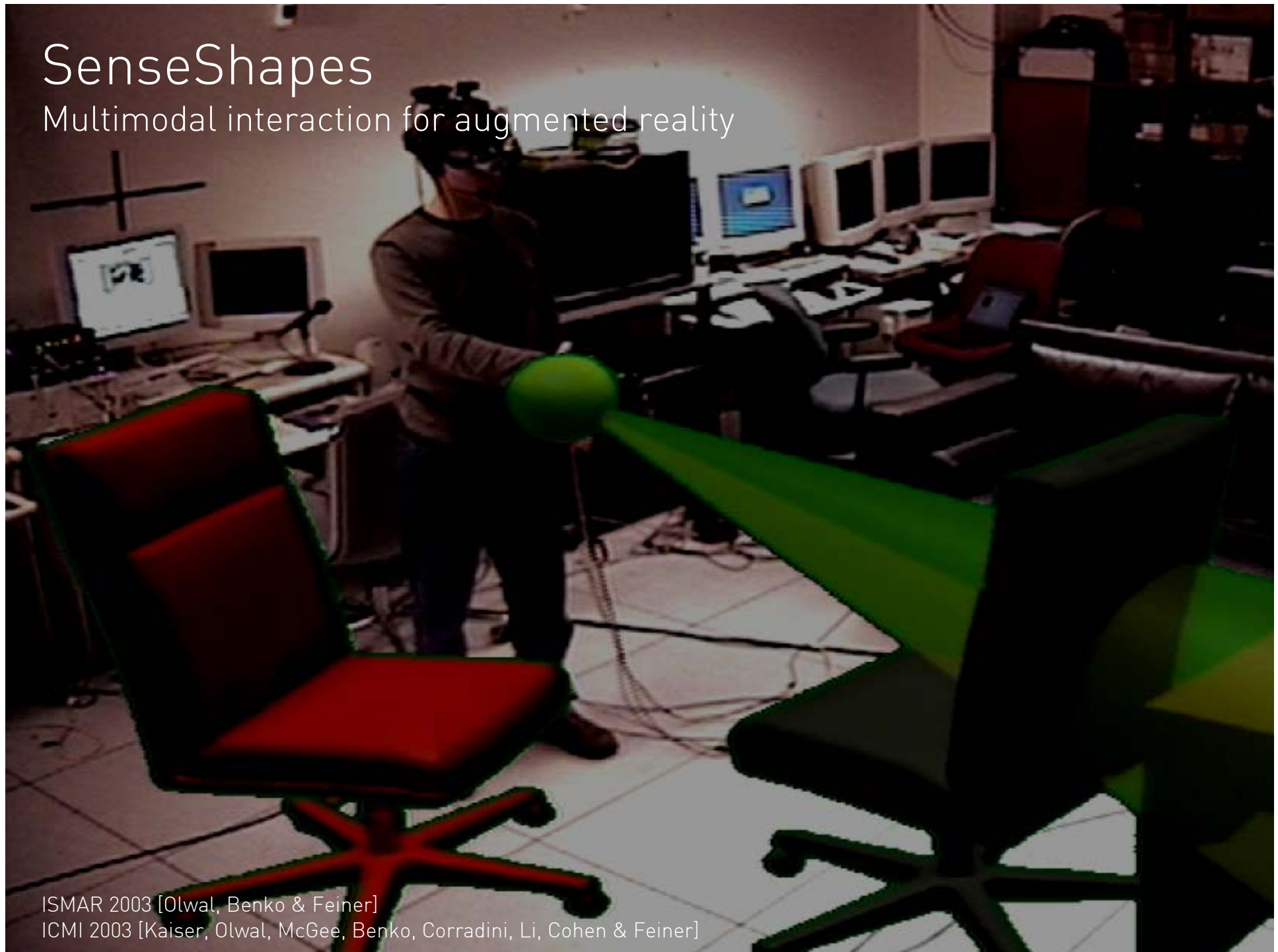
- MIT Media Lab
- Columbia University
- Royal Institute of Technology
- Microsoft Research
- University of California
- Rhode Island School of Design

Cambridge, MA
New York, NY
Stockholm, Sweden
Redmond, WA
Santa Barbara, CA
Providence, RI



SenseShapes

Multimodal interaction for augmented reality

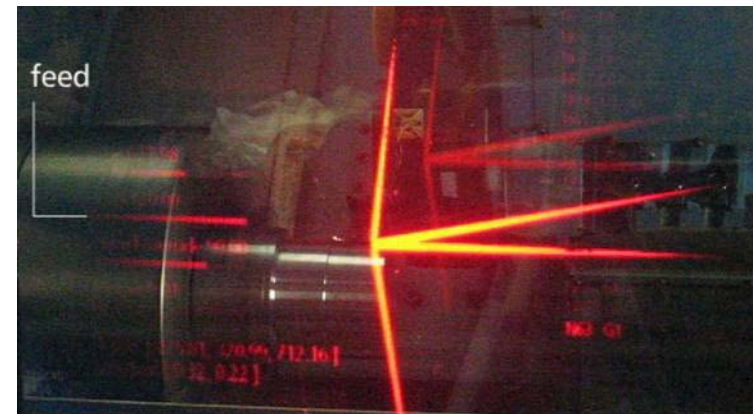
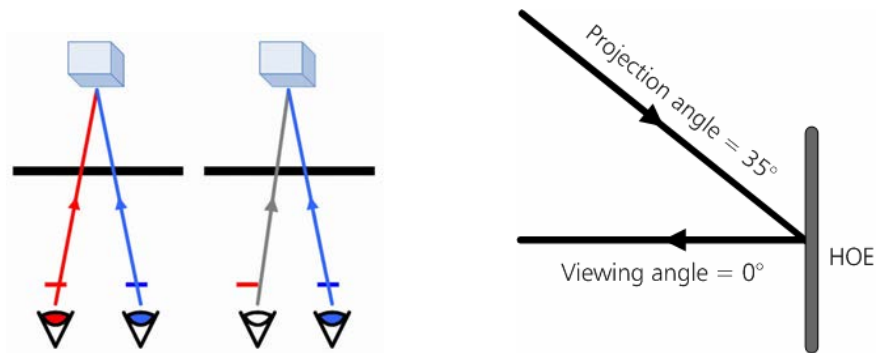
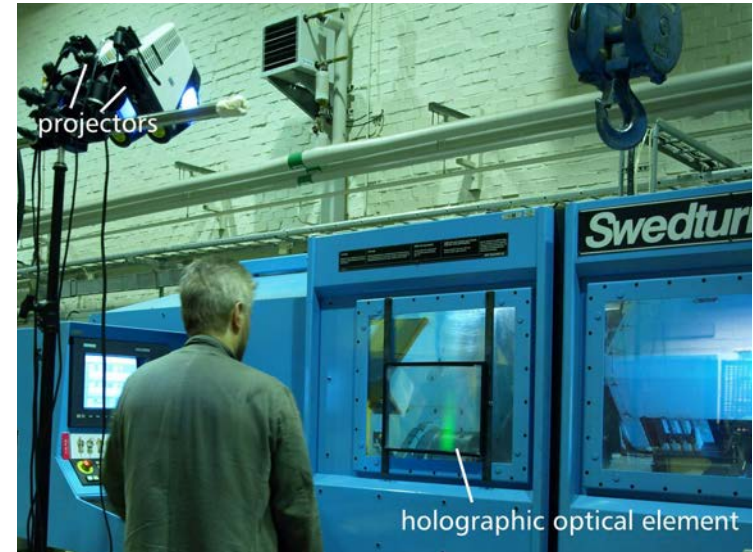
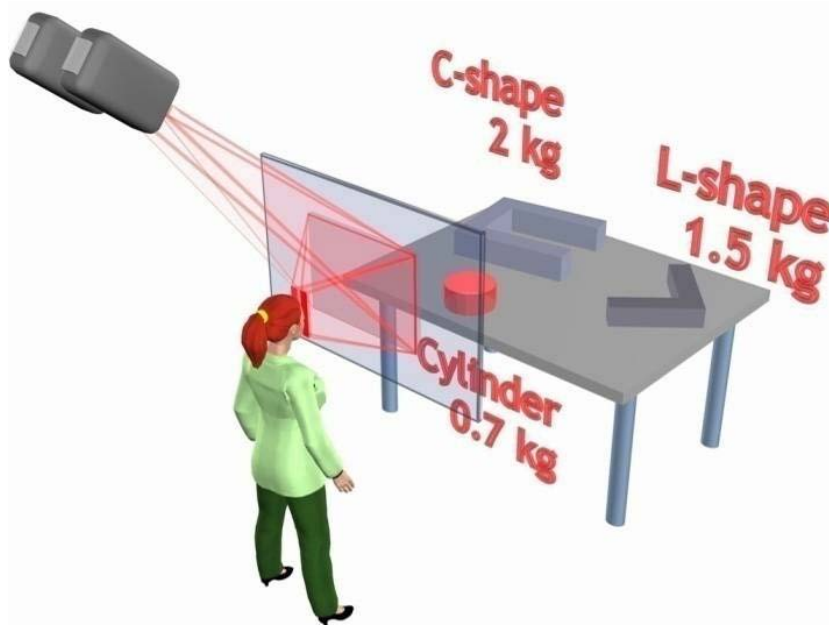


ISMAR 2003 [Olwal, Benko & Feiner]

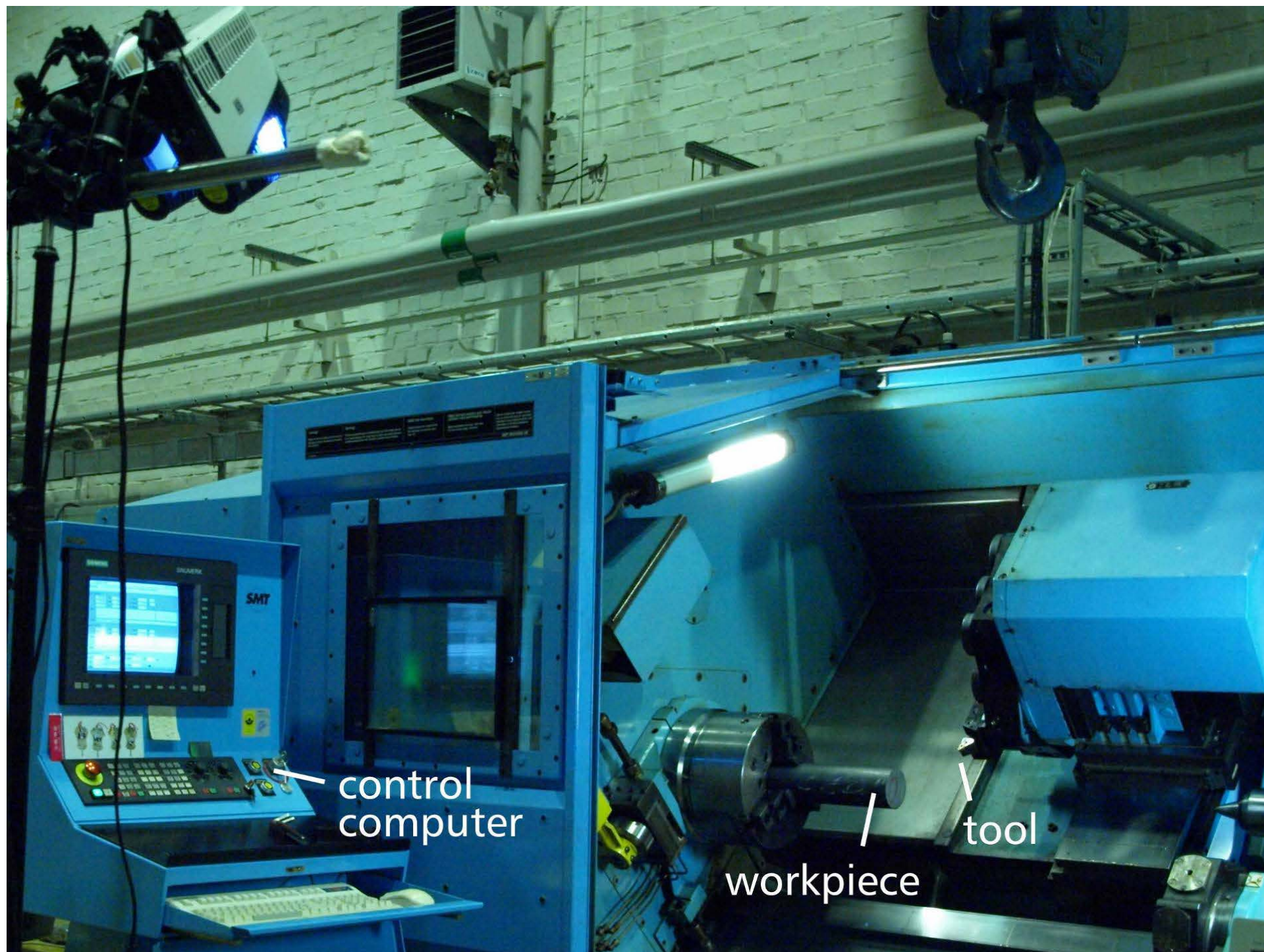
ICMI 2003 [Kaiser, Olwal, McGee, Benko, Corradini, Li, Cohen & Feiner]

ASTOR

Transparent window with autostereoscopic 3D overlays



SPIE 2008 [Olwal, Gustafsson & Lindfors]
ISMAR 2005 [Olwal, Lindfors, Gustafsson, Kjellberg & Mattson]
SIGGRAPH 2004 Sketches [Olwal, Lindfors & Gustafsson]



control
computer

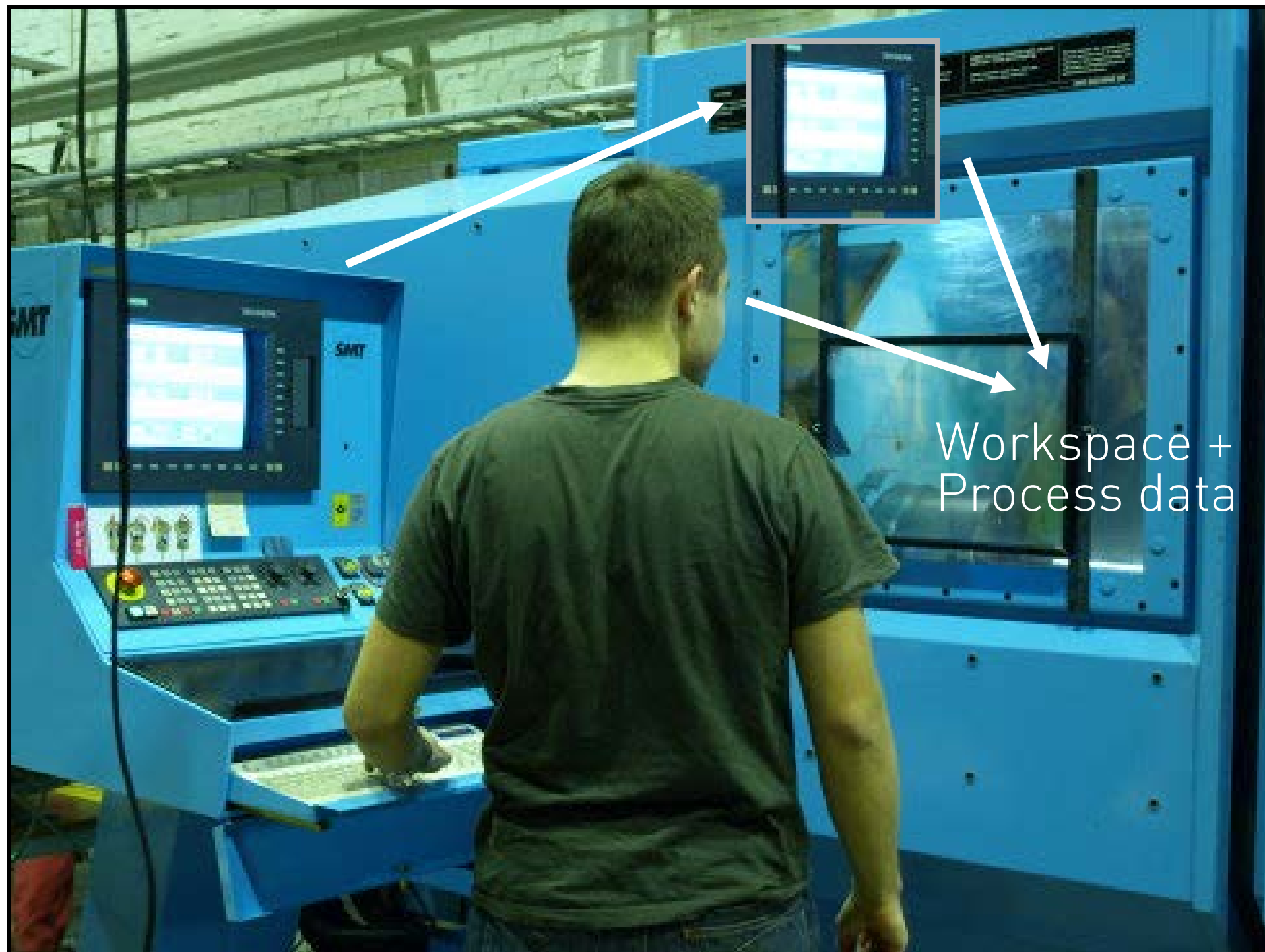
workpiece

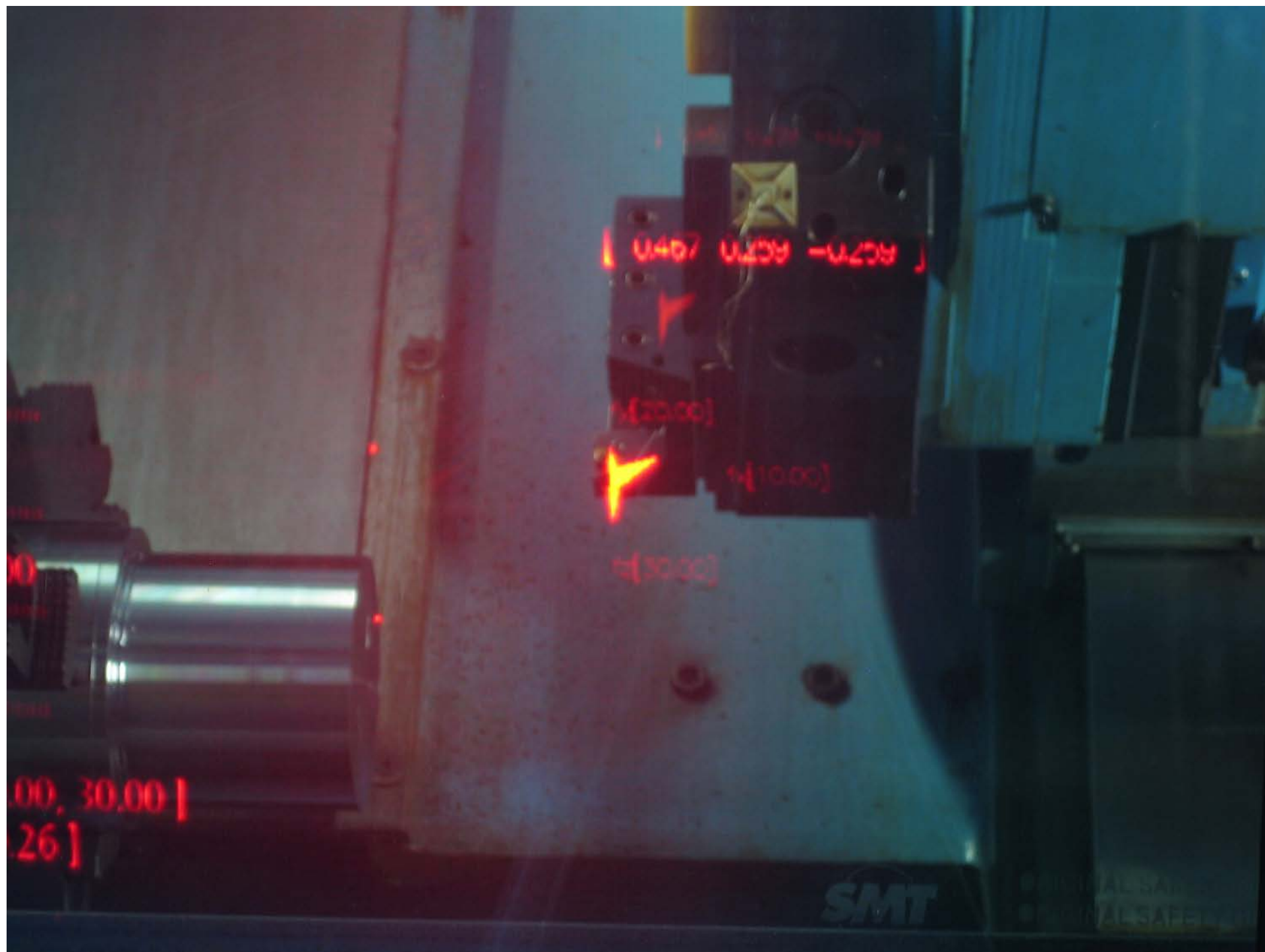
tool

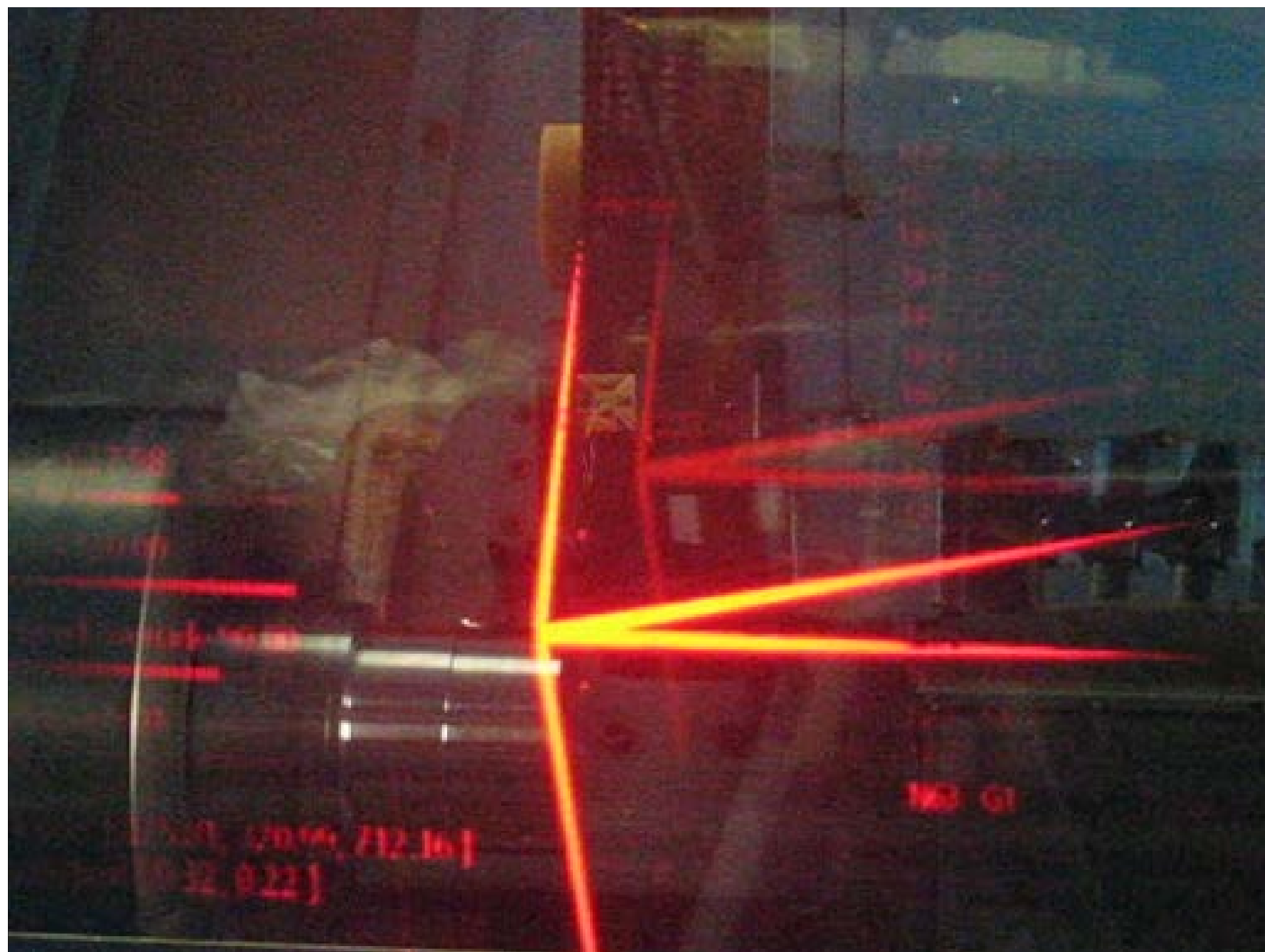


Process data

Workspace







video:

http://web.media.mit.edu/~olwal/?astor_video

Immaterial displays

Face-to-face, reach-through & walk-through interaction



3DTV Book 2008 [DiVerdi, Olwal, Rakkolainen & Höllerer]

VR 2006 [Olwal, DiVerdi, Rakkolainen & Höllerer]

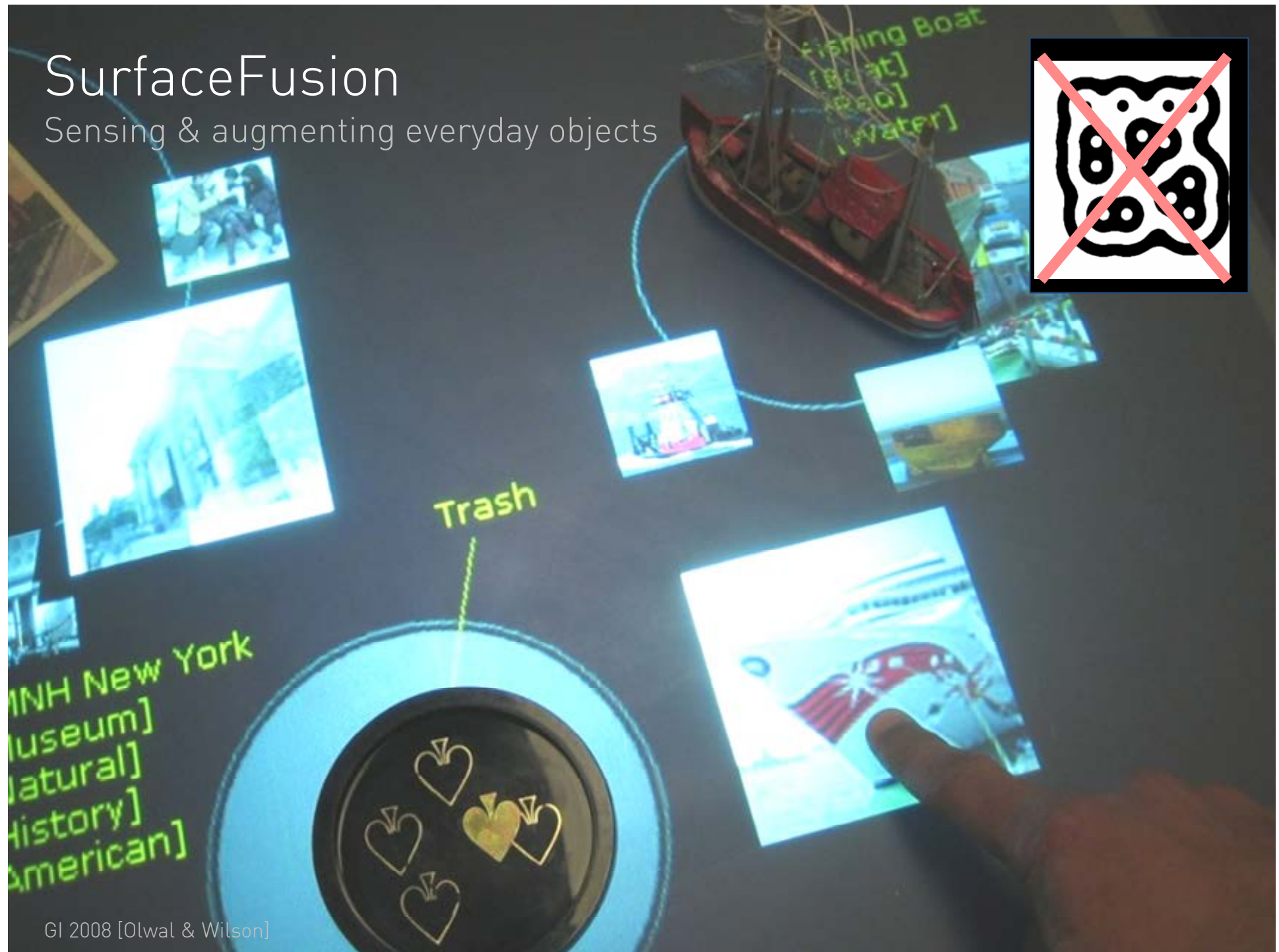
SIGGRAPH 2005 Emerging Technologies [Rakkolainen, DiVerdi, Olwal, Candussi & Höllerer]

video:

http://web.media.mit.edu/~olwal/?immaterial_video

SurfaceFusion

Sensing & augmenting everyday objects



video:

http://web.media.mit.edu/~olwal/?surfacefusion_video

TANGIBLE UIs & MOBILE AR

SurfaceFusion

RFID + vision → ID + track everyday objects



LightSense

Dynamic augmentation of printed media



LUMAR

Hybrid 2D + 3D handheld AR



Hybrid surface interaction

Distributed interaction with large displays



Spatially aware handhelds

Enhancing interaction with large displays



TEI 2009 [Olwal & Feiner]
INTERACT 2009 [Olwal]

video:

http://web.media.mit.edu/~olwal/?lightsense_video

HYBRID UIs & INTERACTION TECHNIQUES

Spatially aware handhelds

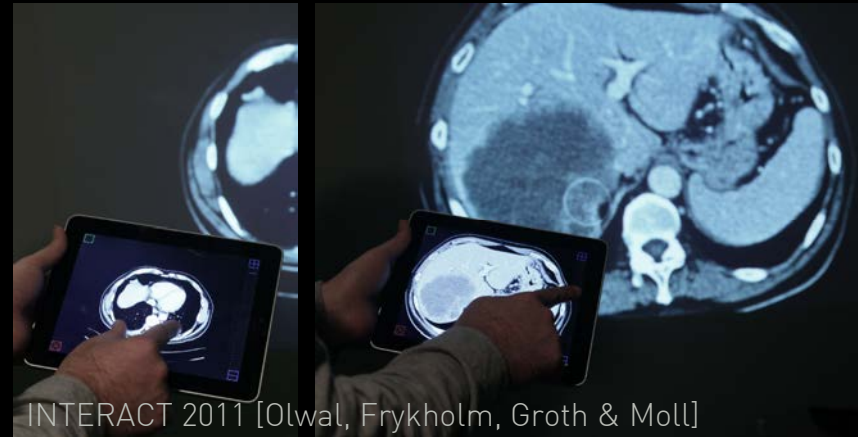
Mobile devices → expanded capabilities



TEI 2009 [Olwal & Feiner]

Collaborative interfaces

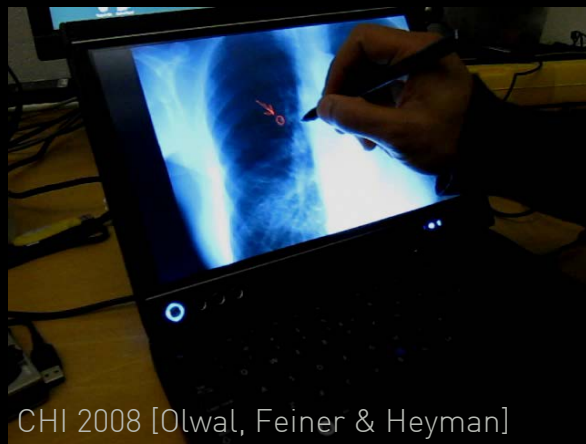
Multiple users, devices & locations



INTERACT 2011 [Olwal, Frykholm, Groth & Moll]

Touch-screen techniques

Minimal gestures for precise interaction



CHI 2008 [Olwal, Feiner & Heyman]

3D interaction

Mobile, gestures, touch, eye tracking, ...



NordiCHI 2008 [Olwal]

SpeckleSense: 2D + 3D optical motion sensing

Fast, precise, low-cost & compact



videos:

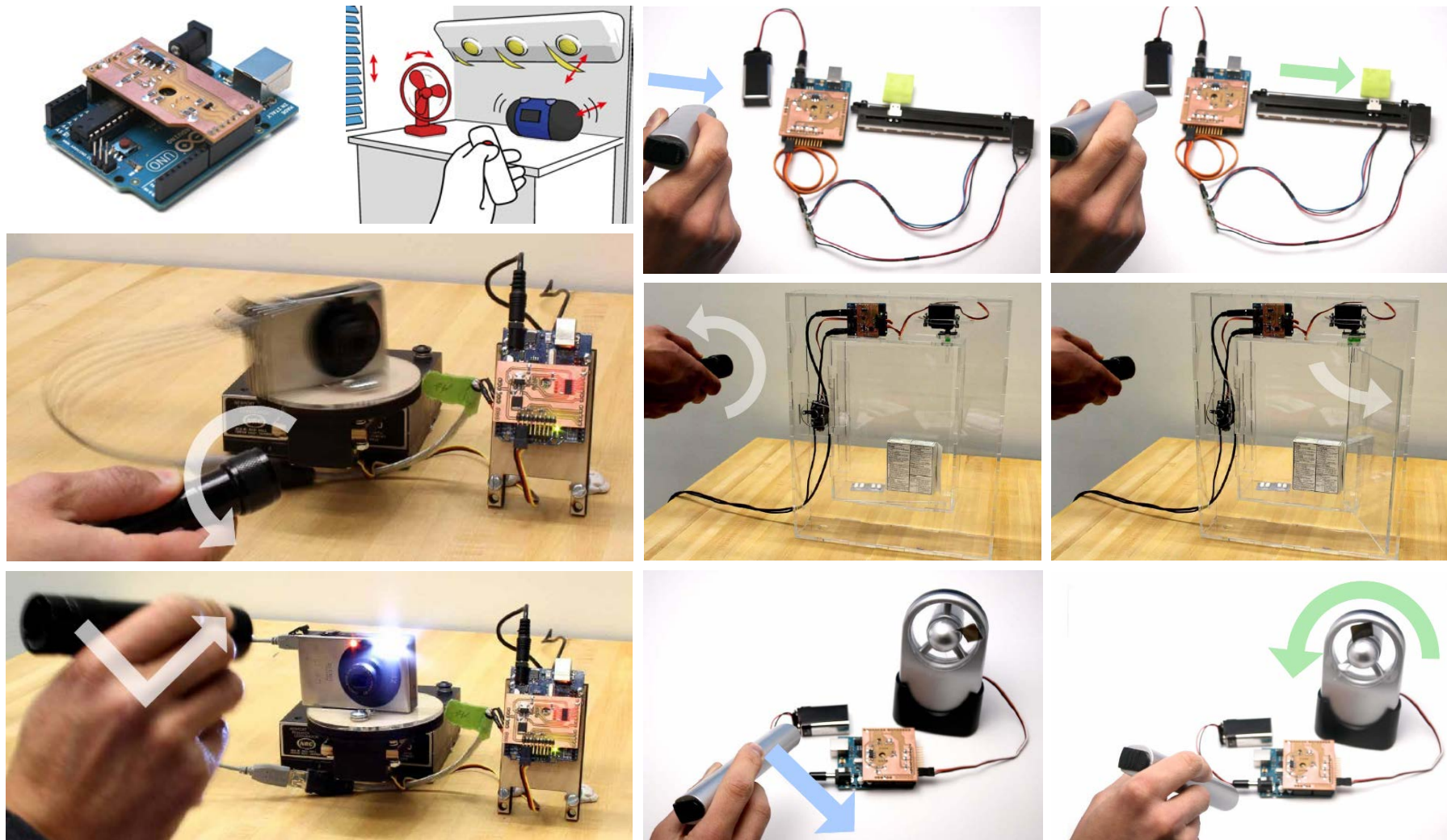
http://web.media.mit.edu/~olwal/?specklesense_video

http://web.media.mit.edu/~olwal/?specklesense_handheld_video

SpeckleEye: Gestural interaction for Ubicomp

Open source software + hardware platform for embedded electronics

www.specklesense.org



ACTUATION & SENSING

Jamming user interfaces

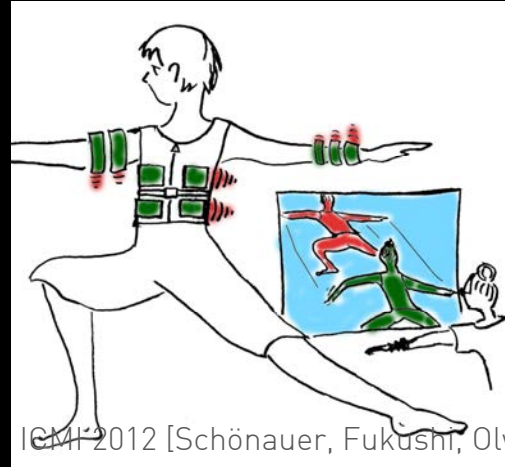
Stiffness & sensing for malleable devices



UIST 2012 Best paper
[Follmer, Leithinger, Olwal, Cheng & Ishii]

Multimodal motion guidance

Dynamic tactile feedback for motor training



ICMI 2012 [Schönauer, Fukushi, Olwal, Kaufmann, & Raskar]



SpeckleSense

2D + 3D optical motion sensing



UIST 2011 [Zizka, Olwal & Raskar]

SpeckleEye

Gestural interaction platform for embedded electronics



CHI 2012 Extended Abstracts [Olwal, Bardagjy, Zizka & Raskar]

Expressive weather

Robotic façade display with weather sayings

www.tactam.com

Tom Tits Experiment 2011 [Tactam & Glittermek]



Exhibit Surface

Multi-touch + RFID

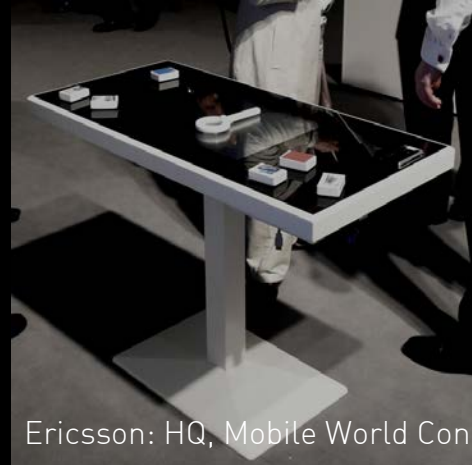


Museum of Naval History, Stockholm



Hybrid Surface

Sensing & interaction for objects & mobile devices



Ericsson: HQ, Mobile World Congress, Volvo Ocean Race, ...



Expressive weather

Robotic façade display with weather sayings



Tom Tits Experiment



PeopleBandit

Oversized slot machine → remixes 1000 locals



Lunagallerian



Jamie Zigelbaum



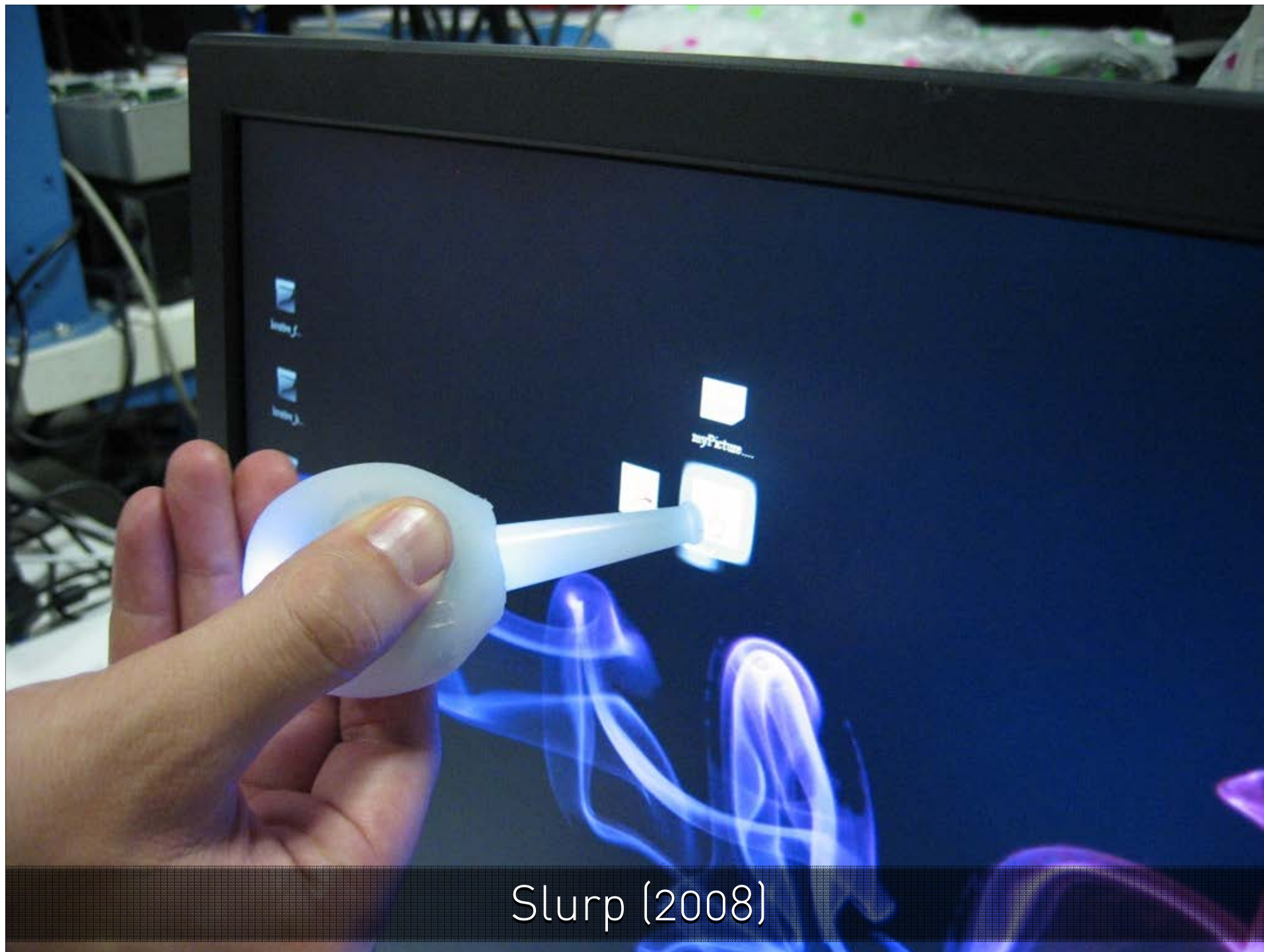
Tangible Video Editor (2006)



SpeakCup (2007)

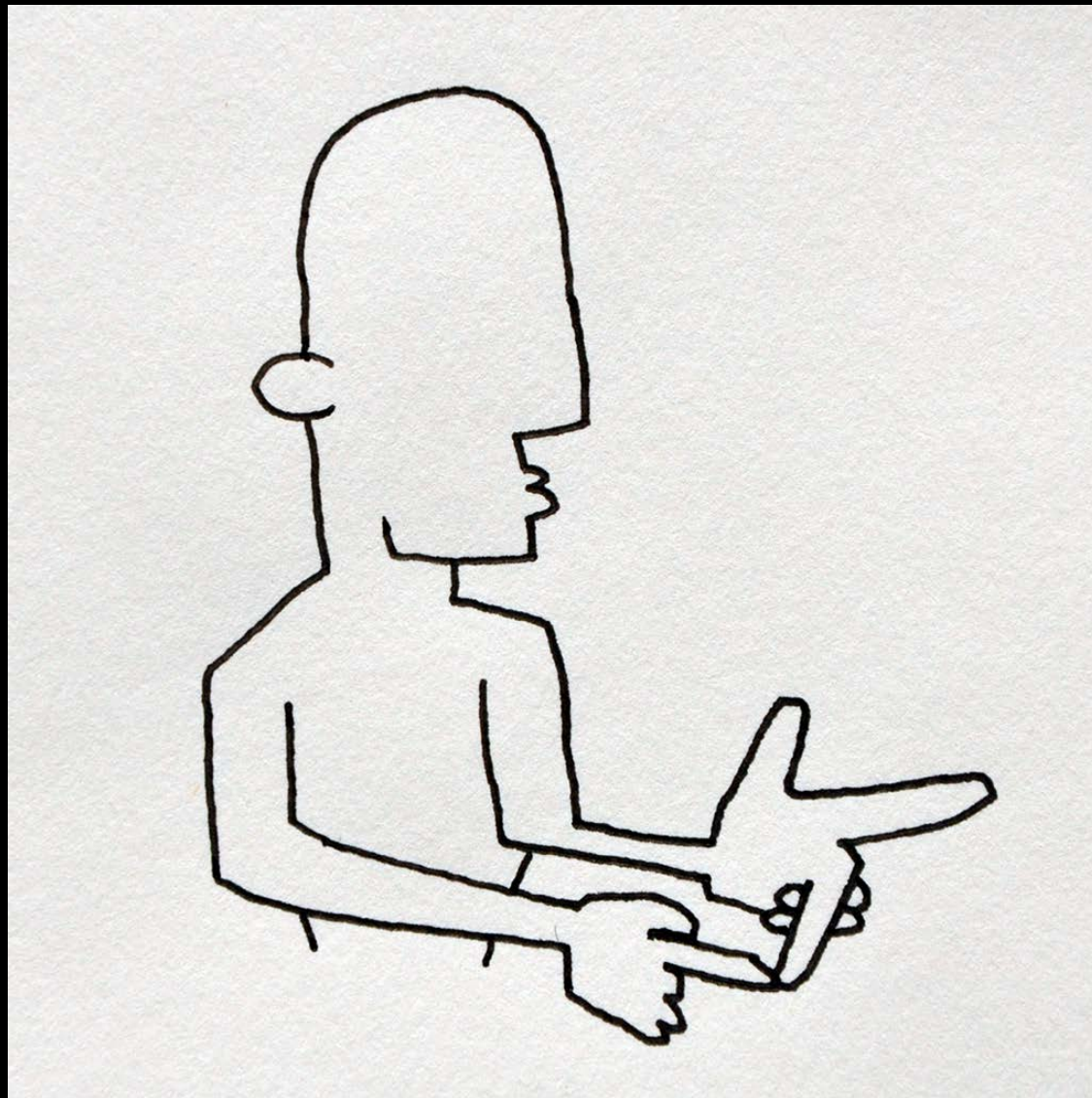


SpeakCup (2007)



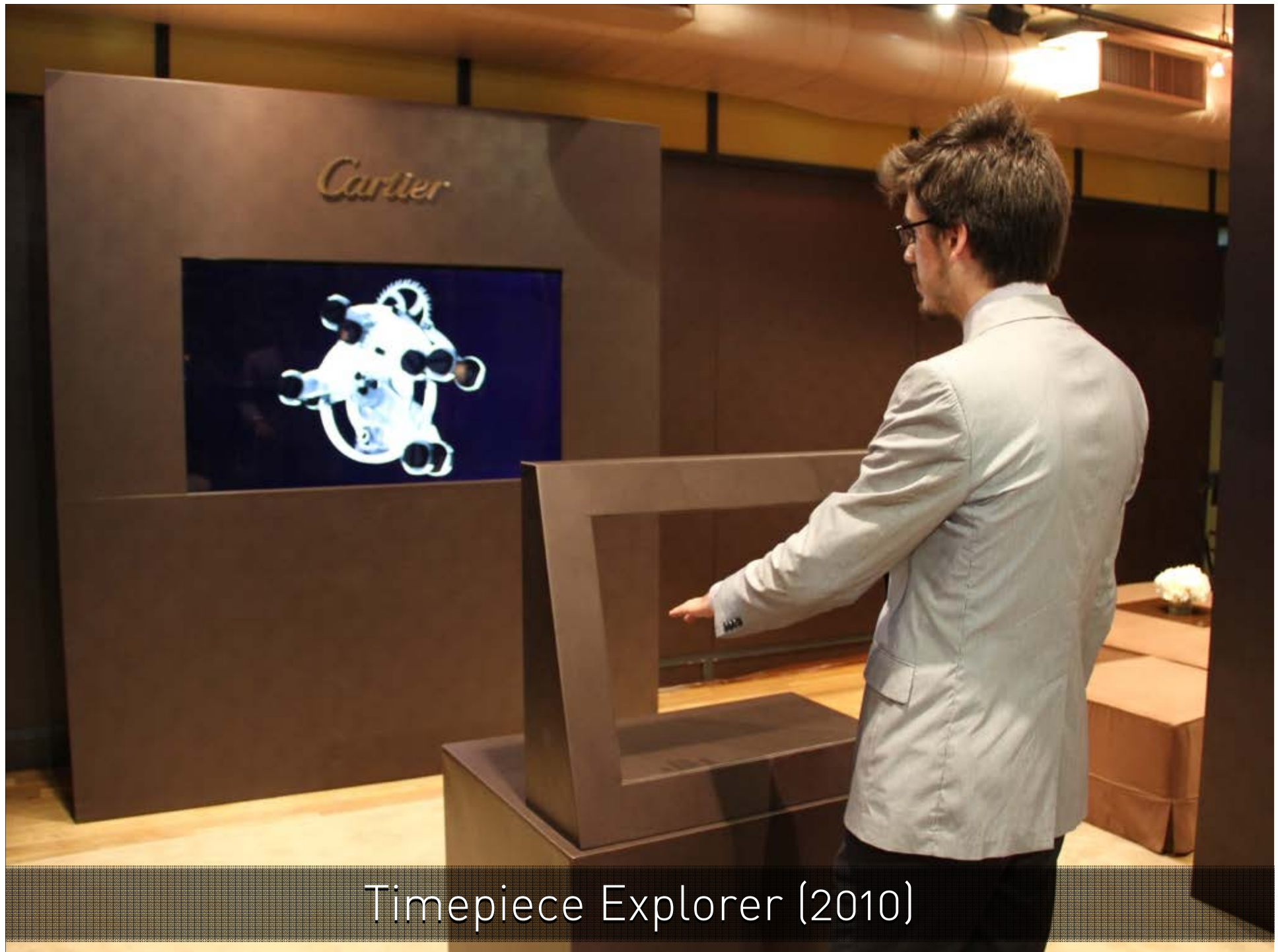
Slurp (2008)

video: <http://jamiezigelbaum.com/slurp>



g-stalt (2009)

video: <http://jamiezigelbaum.com/g-stalt>



Timepiece Explorer (2010)

video: <http://jamiezigelbaum.com/timepiece-explorer>



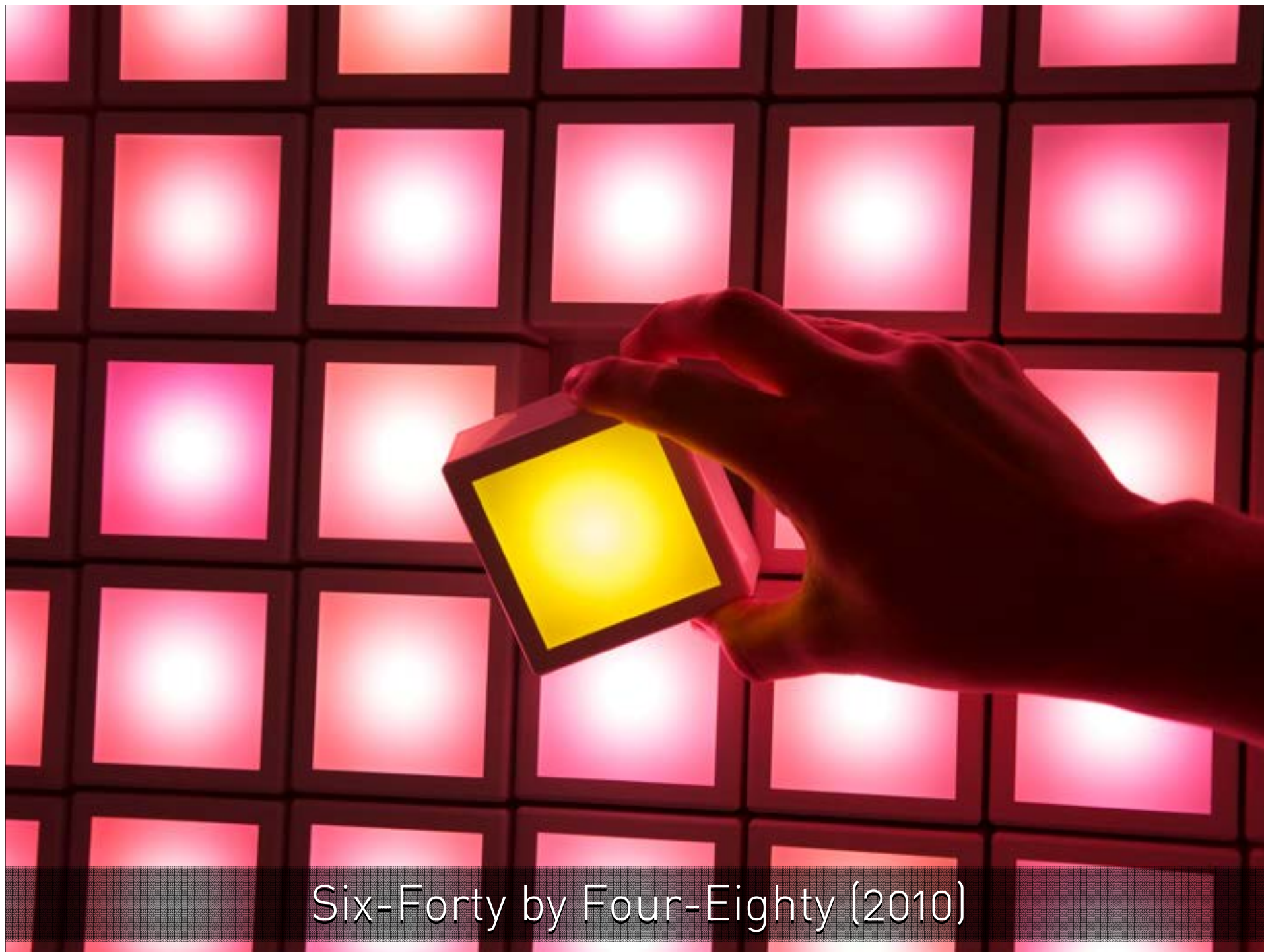
Reach (2012)

video: <http://jamiezigelbaum.com/reach>



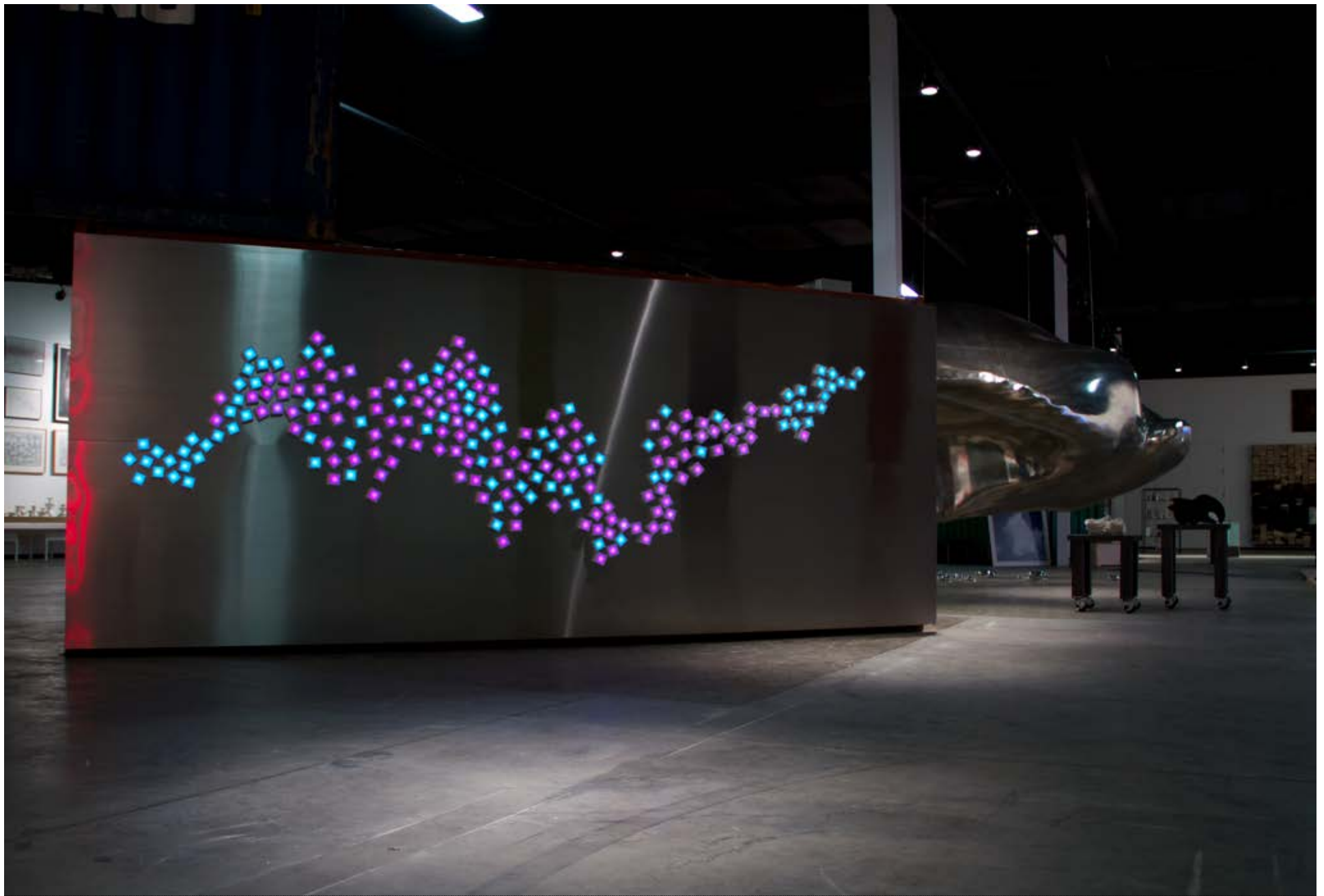
This Too Shall Pass (2010)

video: <http://jamiezigelbaum.com/this-too-shall-pass>



Six-Forty by Four-Eighty (2010)

video: <http://jamiezigelbaum.com/six-forty-by-four-eighty>

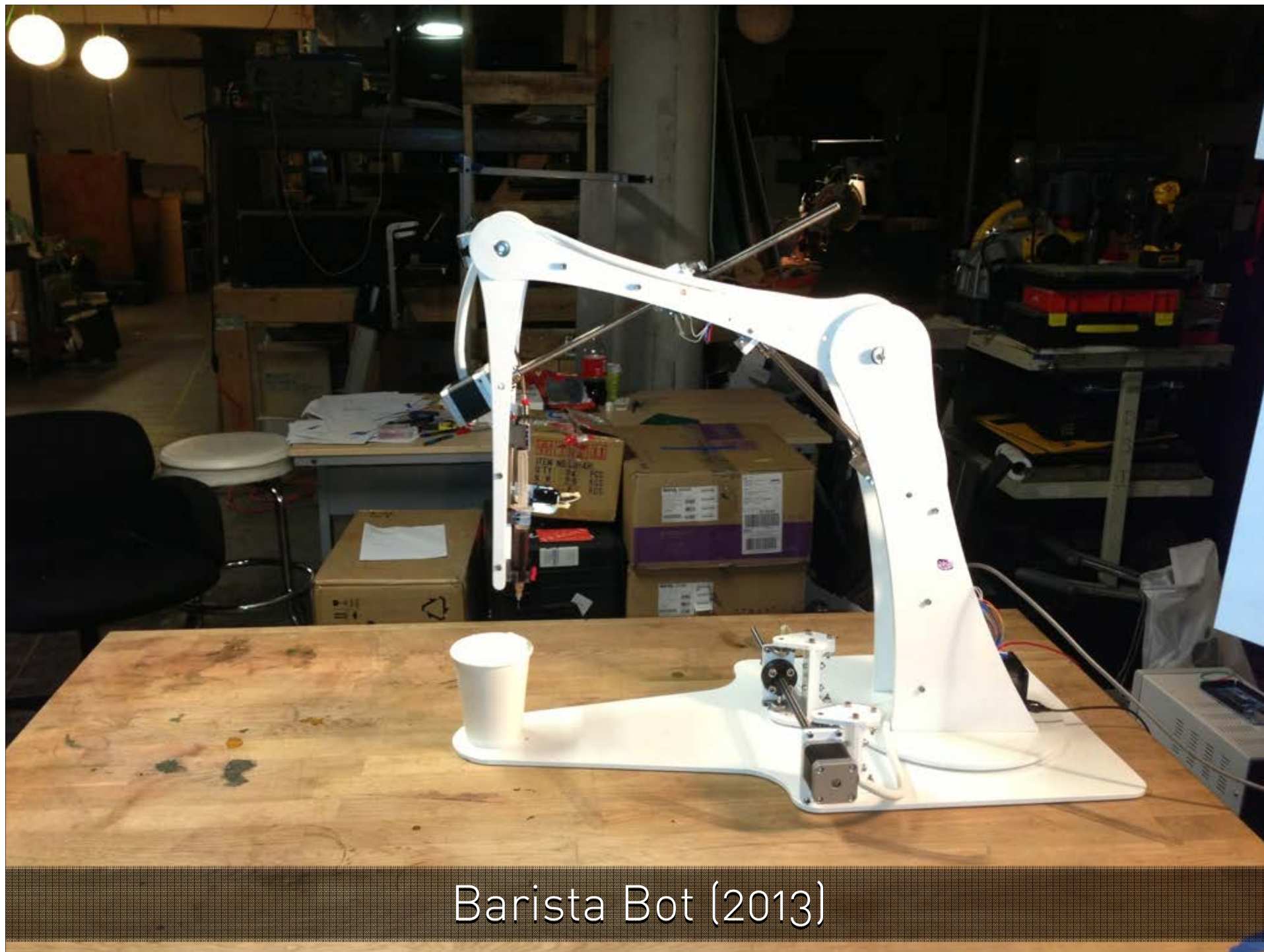


Six-Forty by Four-Eighty (2010)



Resolution (2012)

<http://jamiezigelbaum.com/resolution>



Barista Bot (2013)



Barista Bot (2013)



"BACK TO THE FUTURE" STARRING MICHAEL J. FOX CHRISTOPHER LLOYD LEA THOMPSON CRISPIN GLOVER WRITTEN BY ROBERT ZEMECKIS & BOB GALE MUSIC BY ALAN SILVESTRI PRODUCED BY BOB GALE AND NEIL CANTON
A UNIVERSAL PICTURE EXECUTIVE PRODUCERS STEVEN SPIELBERG KATHLEEN KENNEDY AND FRANK MARSHALL DIRECTED BY ROBERT ZEMECKIS
WWW.UNIVERSALPICTURES.CO.UK

Film © 1985 & 2010 Universal Studios. All Rights Reserved.

Cambridge Workshop

Jake Bernstein: Ph.D. candidate, MIT Media Lab

Eric Gunther: founder, Sosolimited

Lauren McCarthy: designer, programmer, artist

Dan Paluska: artist, roboticist

Nadya Peek: Ph.D. candidate, MIT Center for Bits and Atoms

David Robert: Ph.D. candidate, MIT Media Lab

New York Workshop

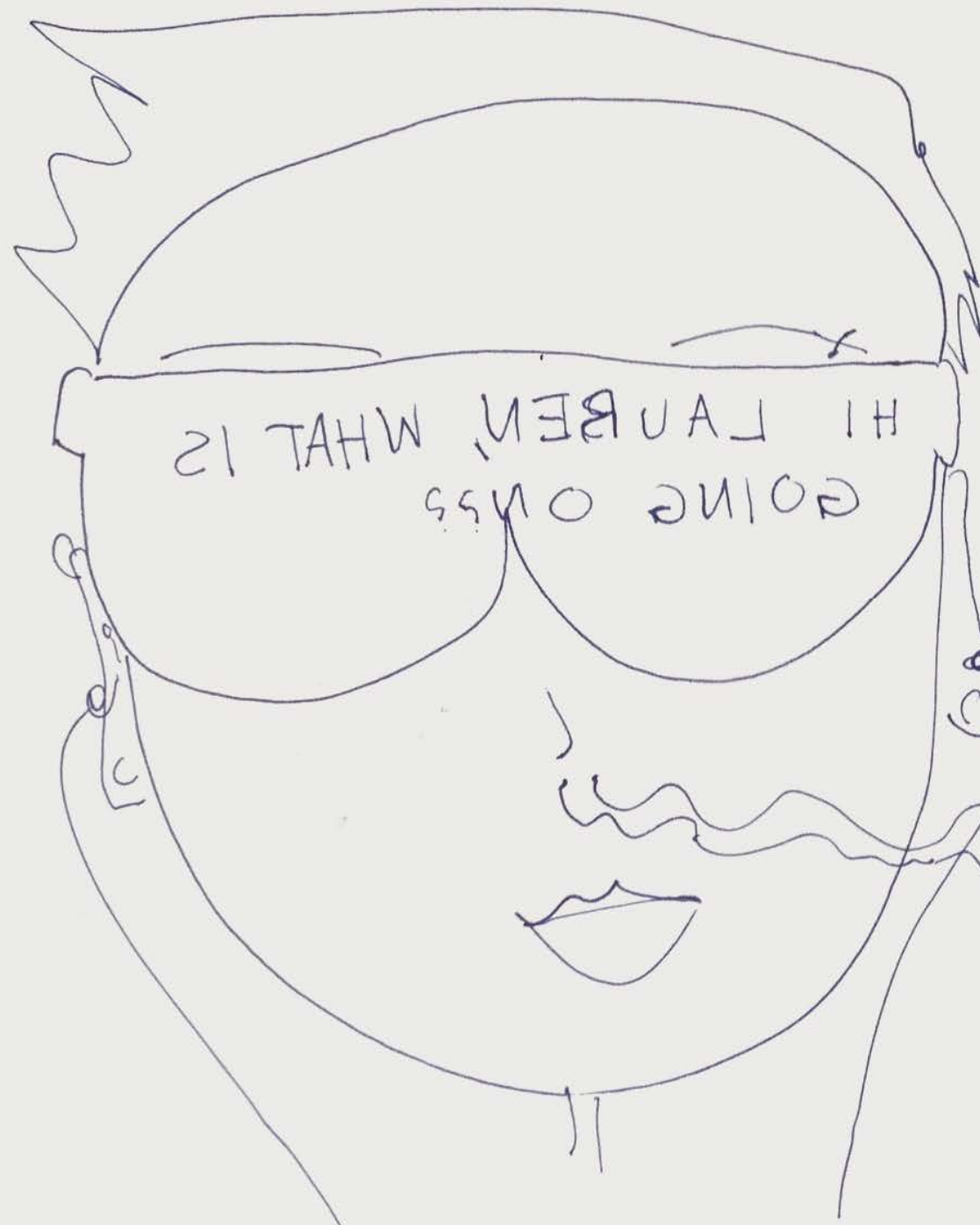
Christine Creamer: product developer

Amanda Parks: media designer & technologist

James Patten: founder, Patten Studio

Marko Tandefelt: director of technology & research, Eyebeam

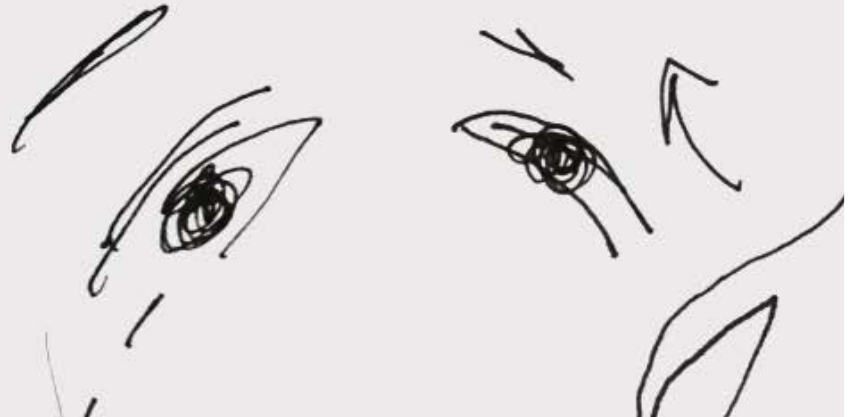
Richard The: senior designer, Google Creative Lab

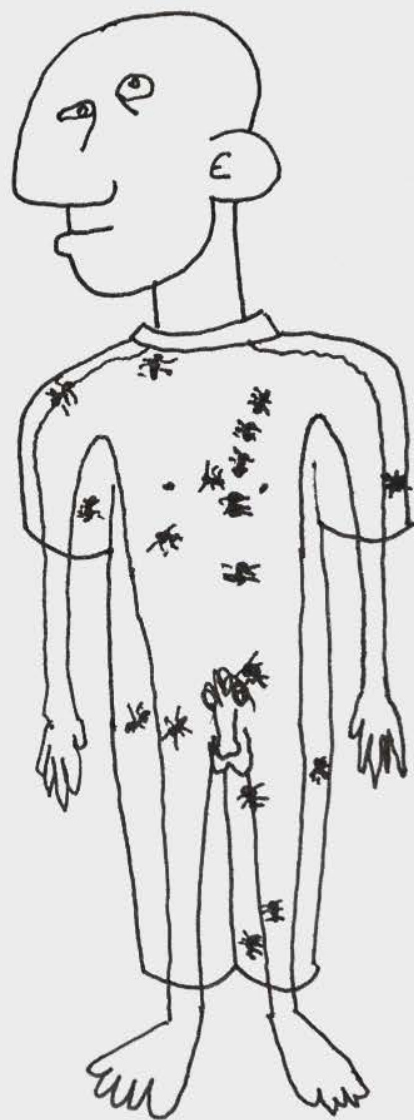


HI
LAUREN
WHAT
IS GOING
ON??



the select-o-smell-a-nator!
only small things you like!
mm







Expectations of cognitive capabilities



© 2008 preston-smalley.com based on Bill Buxton @ Interaction08, Feb 10, 2008

infinite choice paralysis (wormhole
fracture Syndrome)

Mind switches to vegetative state from repeated exposure to
endless choices of ~~interactive~~ sensory input feeds. reality

Augmentations when ^{subject leaves} ~~augmentation~~ ~~the~~ environments

Symptoms can persist. Subject appears to be "pulled into" that reality

Brain scans indicate cortical areas associated
with visual & audio reception ~~become~~ larger blood flow

& alternate sensory areas become oxygen starved,
even after augmented reality is removed.

Subject is paralyzed by

2 / puppet interface

Cognitive control in media multitaskers

Eyal Ophir^a, Clifford Nass^{b,1}, and Anthony D. Wagner^c

^aSymbolic Systems Program and ^bDepartment of Communication, 450 Serra Mall, Building 120, Stanford University, Stanford, CA 94305-2050; and ^cDepartment of Psychology and Neurosciences Program, Jordan Hall, Building 420, Stanford University, Stanford, CA 94305-2130

Edited by Michael I. Posner, University of Oregon, Eugene, OR, and approved July 20, 2009 (received for review April 1, 2009)

Chronic media multitasking is quickly becoming ubiquitous, although processing multiple incoming streams of information is considered a challenge for human cognition. A series of experiments addressed whether there are systematic differences in information processing styles between chronically heavy and light media multitaskers. A trait media multitasking index was developed to identify groups of heavy and light media multitaskers. These two groups were then compared along established cognitive control dimensions. Results showed that heavy media multitaskers are more susceptible to interference from irrelevant environmental stimuli and from irrelevant representations in memory. This led to the surprising result that heavy media multitaskers performed worse on a test of task-switching ability, likely due to reduced ability to filter out interference from the irrelevant task set. These results demonstrate that media multitasking, a rapidly growing societal trend, is associated with a distinct approach to fundamental information processing.

attention | cognition | executive function | multitasking | working memory

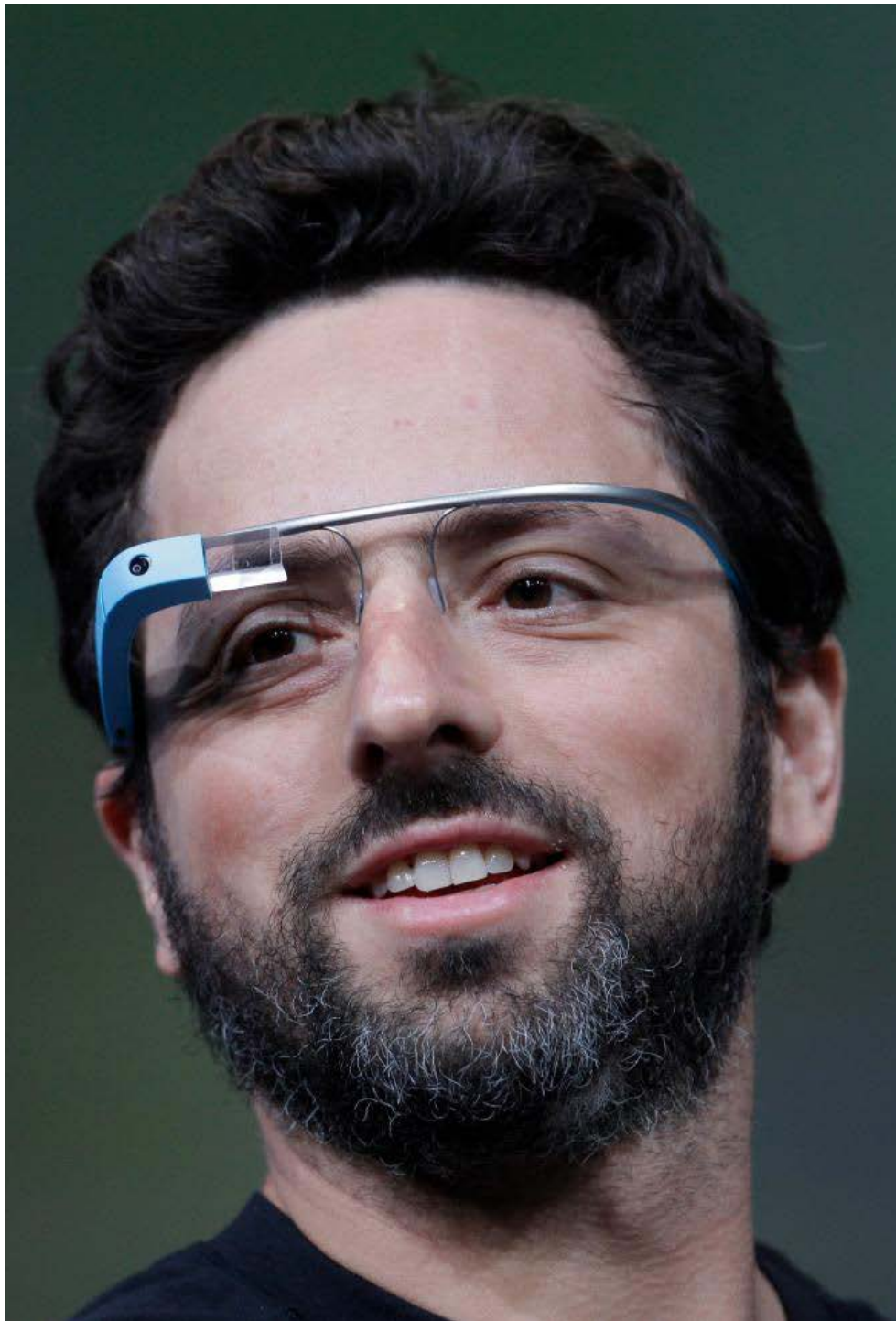
In an ever-more saturated media environment, media multitasking—a person's consumption of more than one item or stream of content at the same time—is becoming an increasingly prevalent phenomenon, especially among the young (1). Researchers have examined the immediate effects of multitasking, and of media multitasking in particular, on memory, learning, and cognitive functioning (2–4). However, it is unknown whether and how chronic heavy multitaskers process information differently than individuals who do not frequently multitask (viewing multitasking as a trait, not simply a state). This issue

media multitasking index to determine the mean number of media a person simultaneously consumes when consuming media and selected those individuals who were heavy media multitaskers (HMMs were one standard deviation or more above the mean) or light media multitaskers (LMMs were one standard deviation or more below the mean) on this index. We then examined these groups' abilities on cognitive control dimensions that could indicate a breadth-bias in cognitive control at different control loci: the allocation of attention to environmental stimuli and their entry into working memory, the holding and manipulation of stimulus and task set representations in working memory, and the control of responses to stimuli and tasks.

Filtering Environmental Distractions: Filter and AX-CPT Tasks. In a test of filtering ability (10)—an ability that can point to a breadth orientation in allowing stimuli into working memory—participants viewed two consecutive exposures of an array of rectangles and had to indicate whether or not a target (red) rectangle had changed orientation from the first exposure to the second, while ignoring distractor (blue) rectangles (Fig. 1A). We measured performance for arrays with two targets and 0, 2, 4, or 6 distractors. Repeated-measures ANOVA revealed a group*distractor level interaction (Fig. 1B), $F(1, 39) = 4.61, P < 0.04$: HMMs' performance was linearly negatively affected by distractors, $F(1, 18) = 9.09, P < 0.01$, whereas LMMs were unaffected by distractors, demonstrating that LMMs have the ability to successfully filter out irrelevant stimuli, $F(1, 21) = 0.18, P > 0.68$.

Further evidence for HMMs' tendency to allow irrelevant stimuli into working memory emerged on the AX-CPT variant (11, 12) of the Continuous Performance Task (13). This task examined whether HMMs and LMMs differ in their response

Why are remote people so much more important?



Stop mushroom foraging in Macau
and come back to dinner.

the not real disorder
characterized by constantly obsessing over how to
get to the 'real' reality, a la existence,
the matrix or inception.

light cases may be characterized by
a withdrawn approach to life and a
disregard for every day events.

More severe cases might suffer from
~~self-mutilating tendencies or from a~~
lack of empathy or concern for others
or the self, extending to self-mutilating
or homicidal tendencies

~~cases~~ therapeutic cures available include
withdrawal from all augmented forms of life
in secluded therapy areas. With more
serious cases medication to suppress the
inhibitor might be ~~sub~~ prescribed.

dear dan

wherever I have sex with my ~~boy~~ girlfriend
she overlaps my body with Justin
Bieber's. I understand he is the

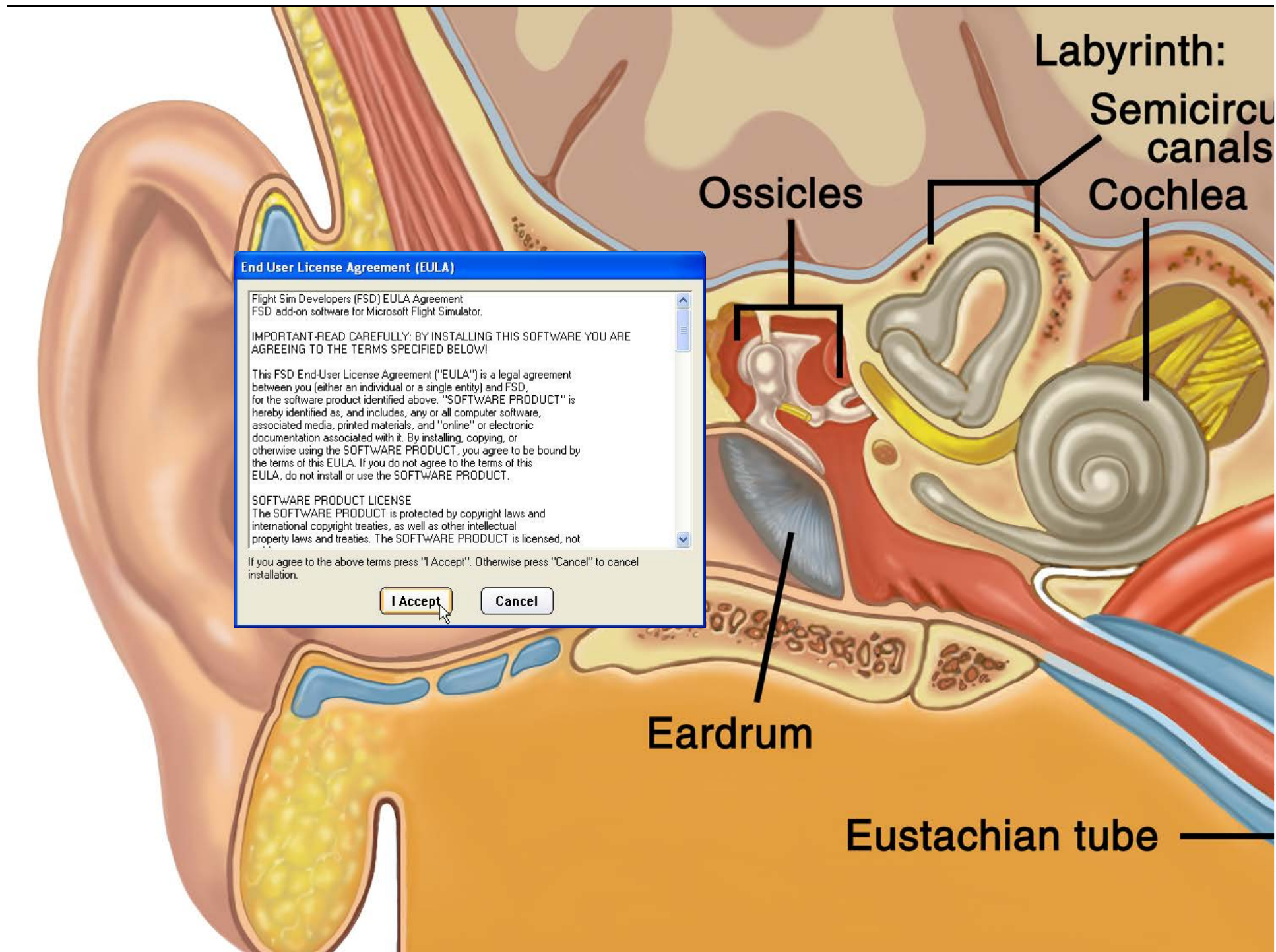
quintessential 30 something bachelor, but
this makes me feel really insecure.

How can I make her want to see me?

yours truly,
not beiber.

Illusory Consensual Partnering (ICP)

The common manifestation of ICP is observed as two people in a long-term ~~par~~ partnership where all or nearly all communication between the partners is passed through two separate consensual reality filters. Each person is involved in a deep ~~in~~ community of reality replacement ~~to~~ and "believes" their partner to be in the same reality although they are not. After years of misperception they realize their error either system ~~at~~ upgrade outages and generally choose to ignore it.



**PART MAN,
PART MACHINE,
ALL COP.**



Local vs. Remote
Focused vs. Distracted
Unified vs. Fractured
Present vs. Absent
Now vs. Later

The following are exercises to do at home!

Please send us your results
(drawings, text, video, or whatever).

olwal@media.mit.edu

jamie@zigelbaum.com

Writing Exercise 1:

Write an entry for the DSM VI explaining a future psychiatric disorder arising from AR interfaces.

Writing Exercise 2:

Write a letter to sex and relationship advice author Dan Savage in 2025, asking advice for an AR-related sexual dysfunction.

Writing Exercise 3:

Write a letter from a lawyer to a defendant laying out the strategy of defense for their AR-related crime.

Performance Exercise 1:

Have a conversation with a friend while you pretend to be using an imaginary future AR device. They have to guess what it is afterwards.

Performance Exercise 2:

Augmented Reality charades. Imagine a future AR interface then stand up in front of your friends and act it out. They can instruct you on what's happening in your world, e.g. "you're about to be hit by a bus!" and you have to react as you would with that interface. They try to guess what the interface is.

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