

emerging techniques

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www.telecom-paristech.fr/~elc

Virtual / Augmented / Mixed Reality

Virtual Reality

- Immersion in a purely virtual world



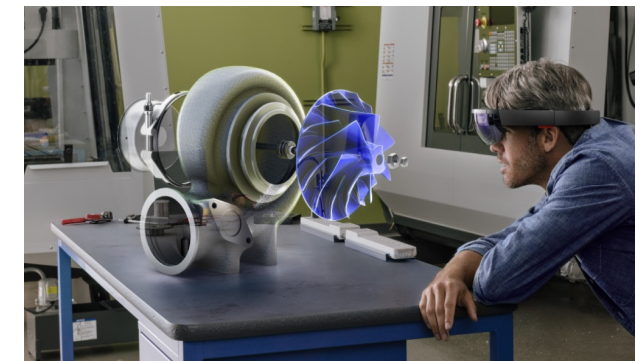
Augmented Reality

- The real world is augmented by virtual representations



Mixed Reality

- Mixes physical and virtual worlds



Virtual Reality

Example : Tilt Brush (Google with HTC Vive)



<https://www.youtube.com/watch?v=TckqNdrdbgk>

Augmented Reality

Smartphones

- Basic techniques, limited possibilities

AR glasses



Google Glasses



Métro Paris
iPhone & iPod Touch

Disponible sur AppStore
metroparisiphone.com

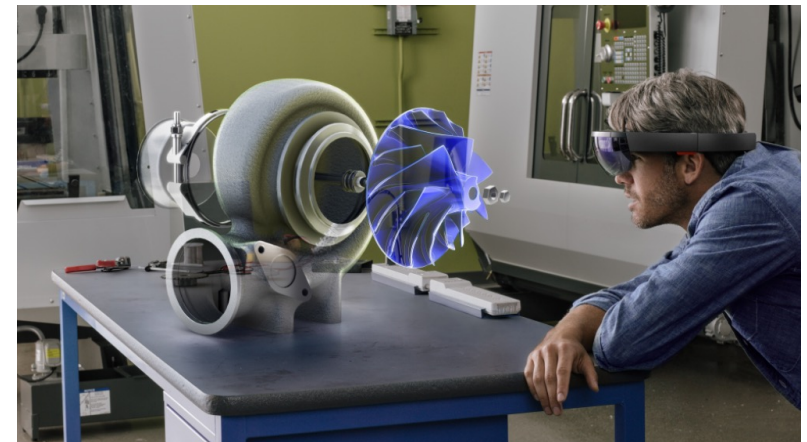
Mixed Reality

The user can interact with virtual representations

- **Mixture** of physical and virtual world
- Typically: semi-immersive glasses
- Blurred border with AR



HoloLens (Microsoft)



Mixed Reality



<https://www.youtube.com/watch?v=ihKUoZxNCIA>

Hololens (Microsoft)

Projection Mapping

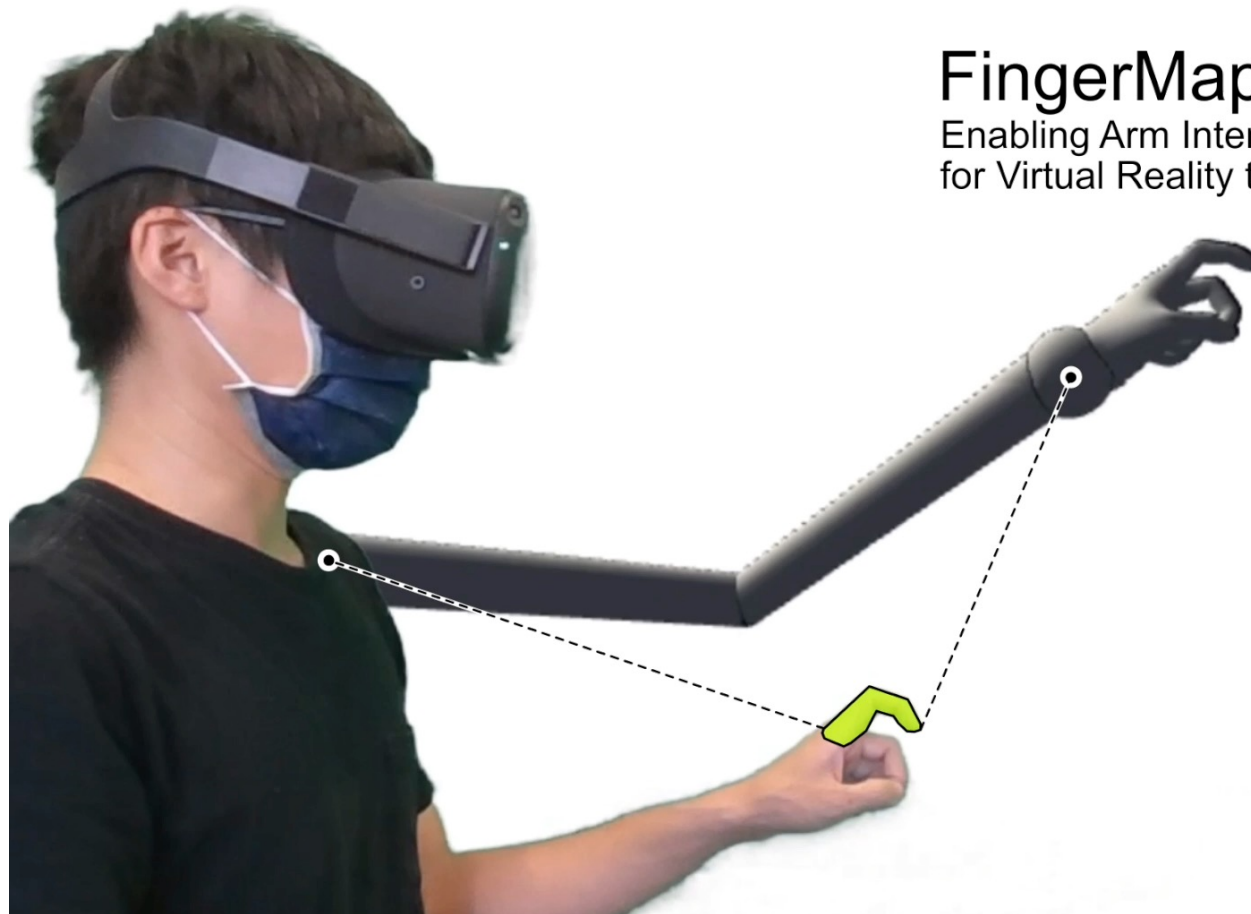
Projection: another way of augmenting the world



IllumiRoom (Microsoft Research)

Interaction

Techniques for interacting efficiently in AR/VR



FingerMapper

Enabling Arm Interaction in Confined Spaces for Virtual Reality through Finger Mappings



Wen-Jie Tseng
Samuel Huron
Eric Lecolinet
Jan Gugenheimer

Ethical issues

Privacy issues

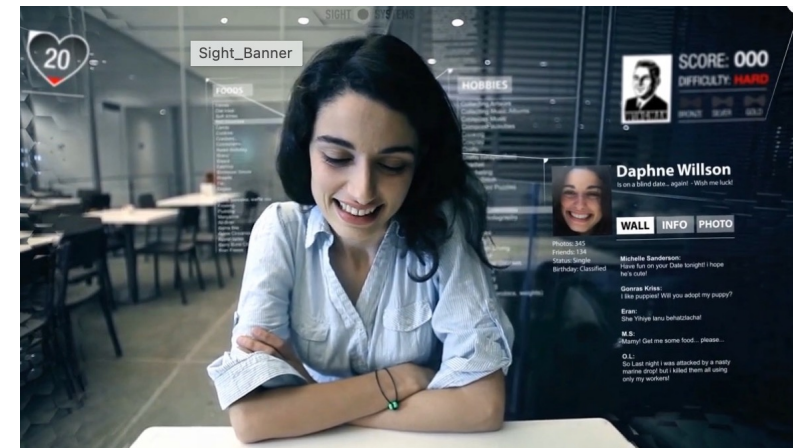
camera + network access

"Dark patterns"

- nudging physical actions
 - can be exploited maliciously
- Sight (Eran May-raz and Daniel Lazo)
https://www.youtube.com/watch?v=IK_cdkpazjl
- Dark Mirror



Thad Starner



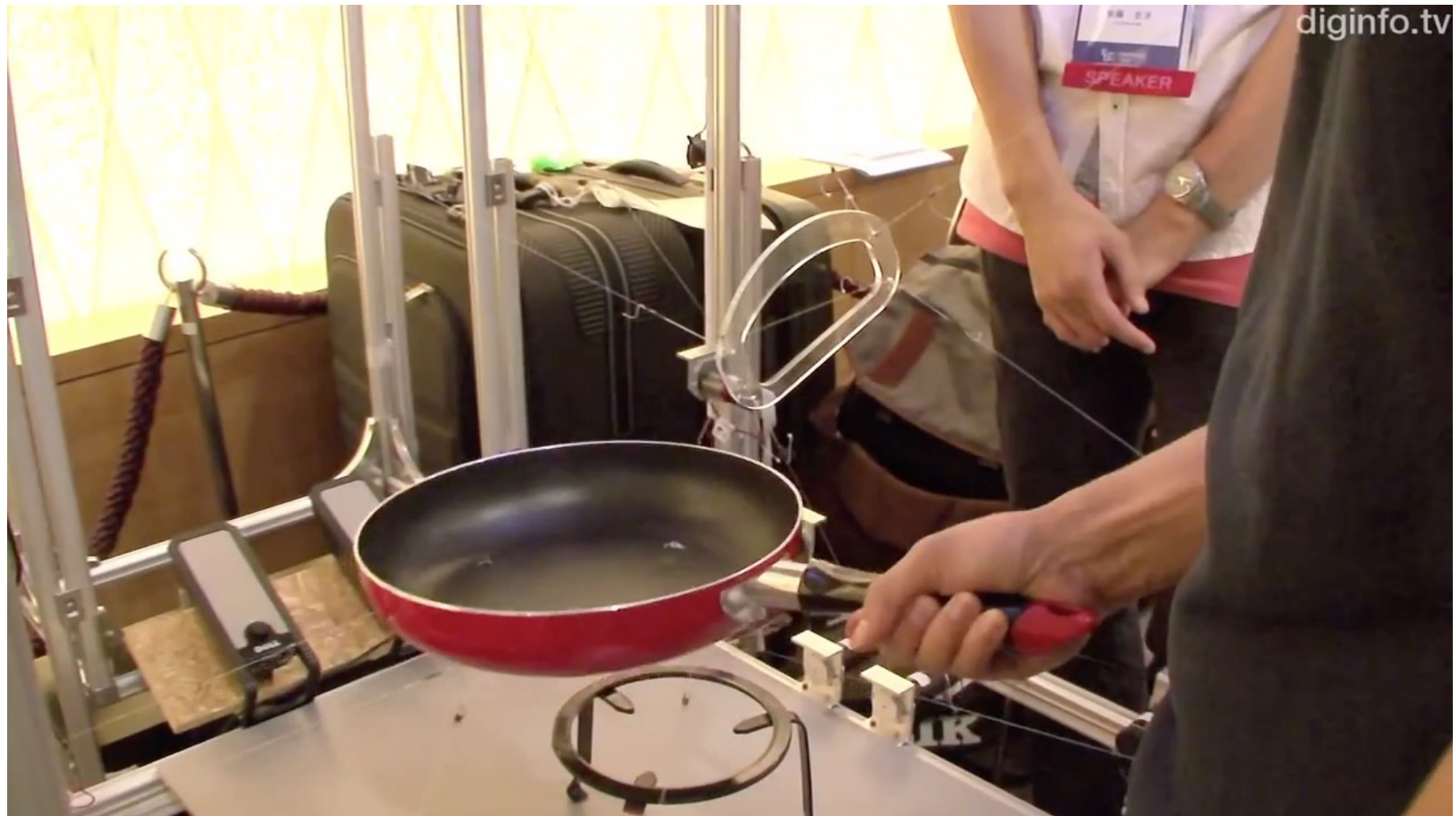
Sight

Copy/paste the real world

IOBrush (MIT Media Lab)

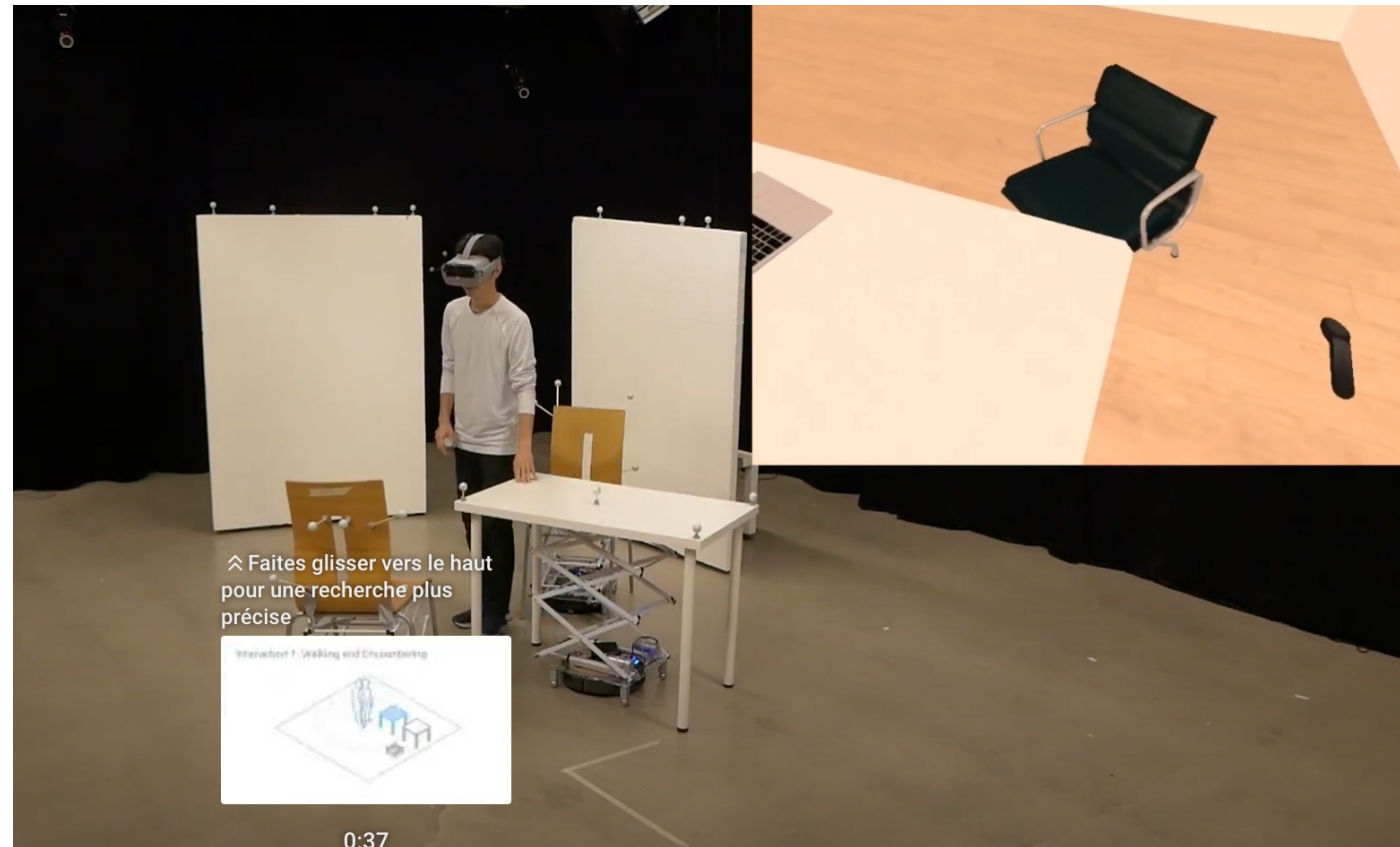


VR + Haptics



Cooking simulator (Tokyo Institute of Technology)

VR + Haptics



RoomShift

Bi-Directional Sketching

Tangible and Physical Interfaces

Interaction with digital information via physical objects

Note: the mouse can be seen as a kind of a tangible interface



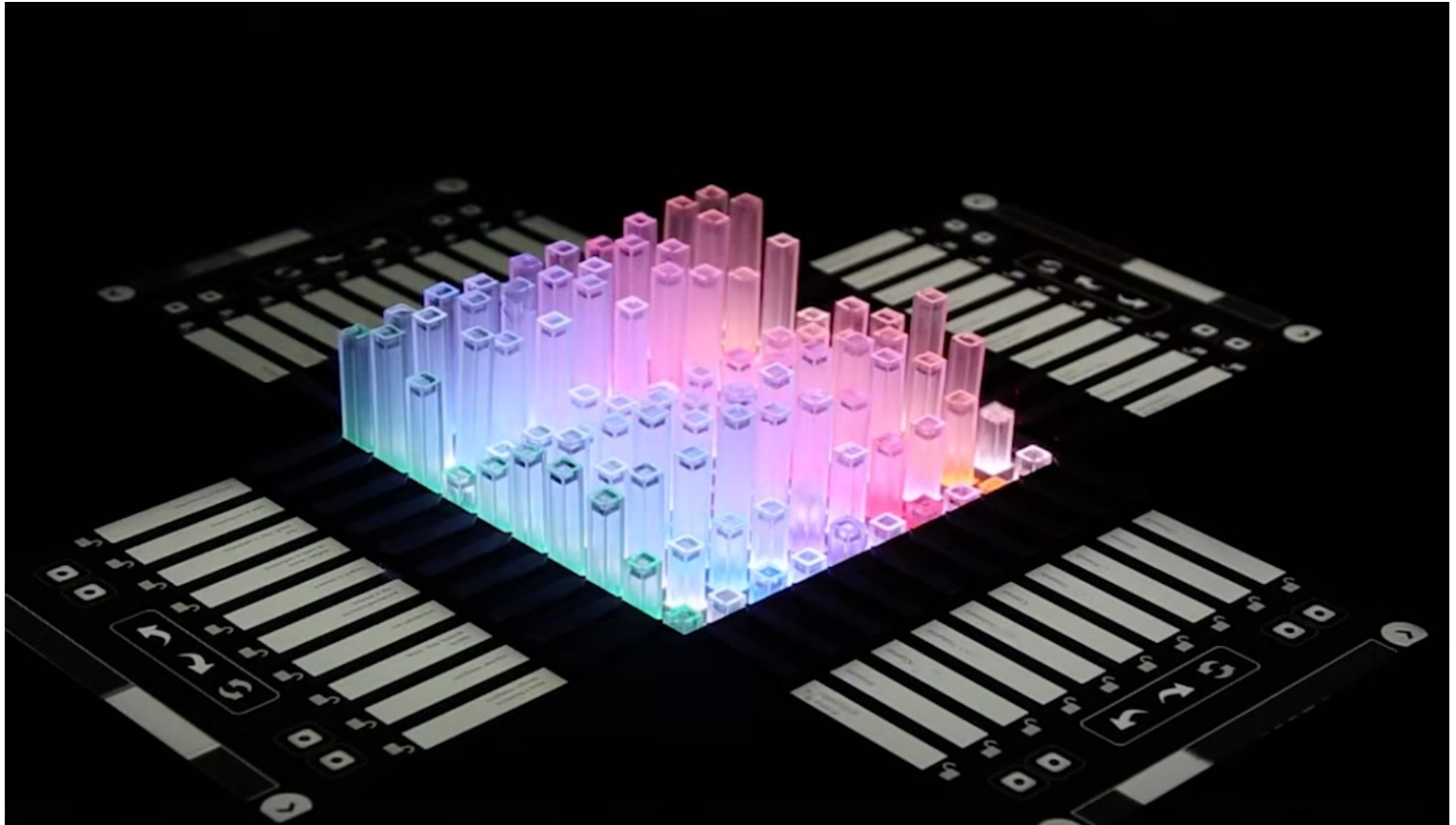
PERCH retail



Reactable (music)

Tangible and Physical Interfaces

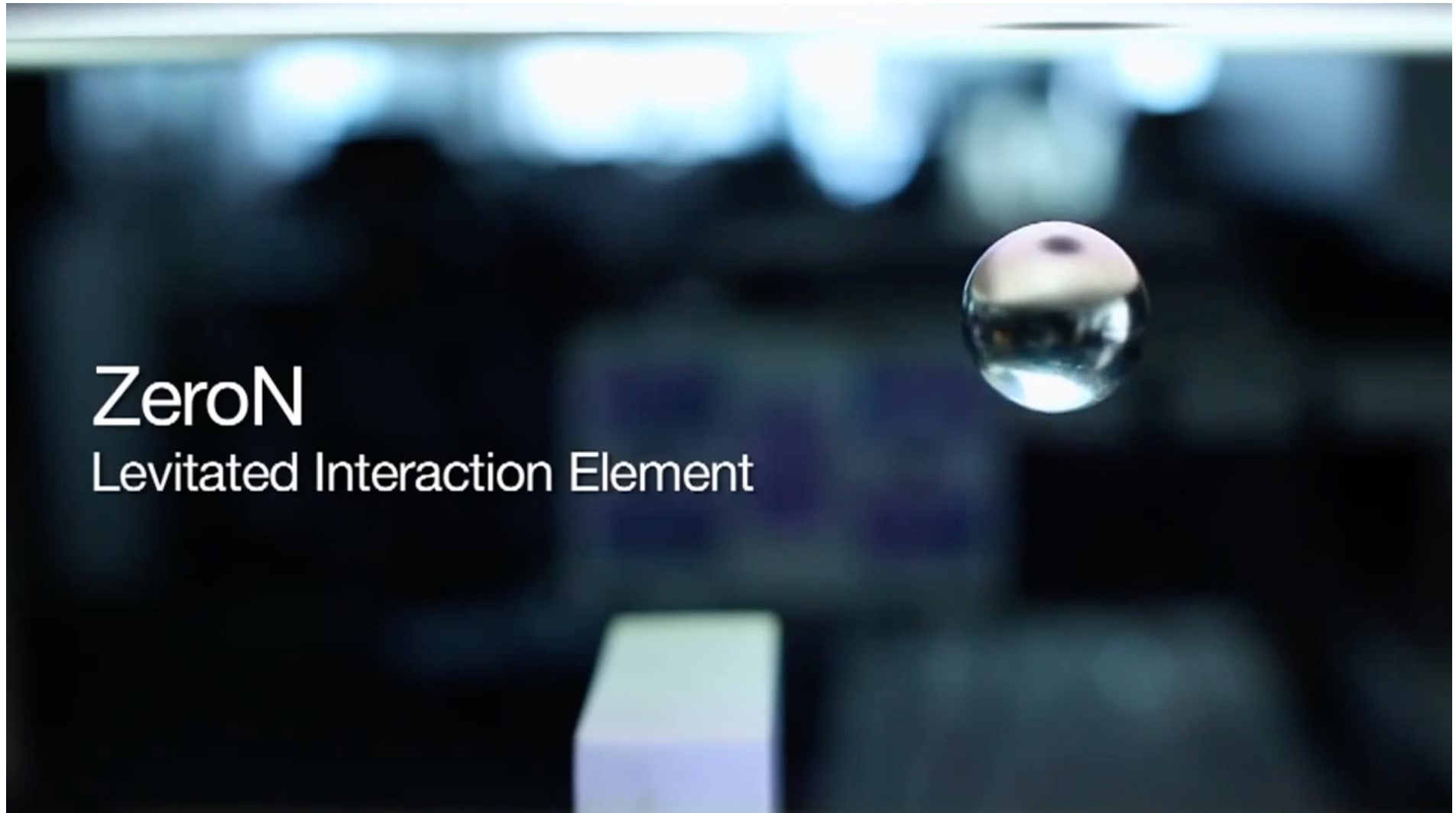
Physical data visualization



Dynamic Physical Bar Chart

Tangible Interfaces

ZeroN: Levitated interaction (MIT Media Lab)



Shape Changing Interfaces

Morphees (Roudaut et al, Bristol Univ.)

Music: Charles Ludig

Morphees: Toward High "Shape Resolution" Self-Actuated Flexible Mobiles

Roudaut A., Karnik A., Löchtefeld M., Subramanian S.



Shape Changing Interfaces

WRIGGLO (Park et al., KAIST, Corée)



https://www.youtube.com/watch?time_continue=16&v=UhUUi5wUy4U

Shape Changing Interfaces

Haptic Edge: mobile version (Jang et al., MIT)

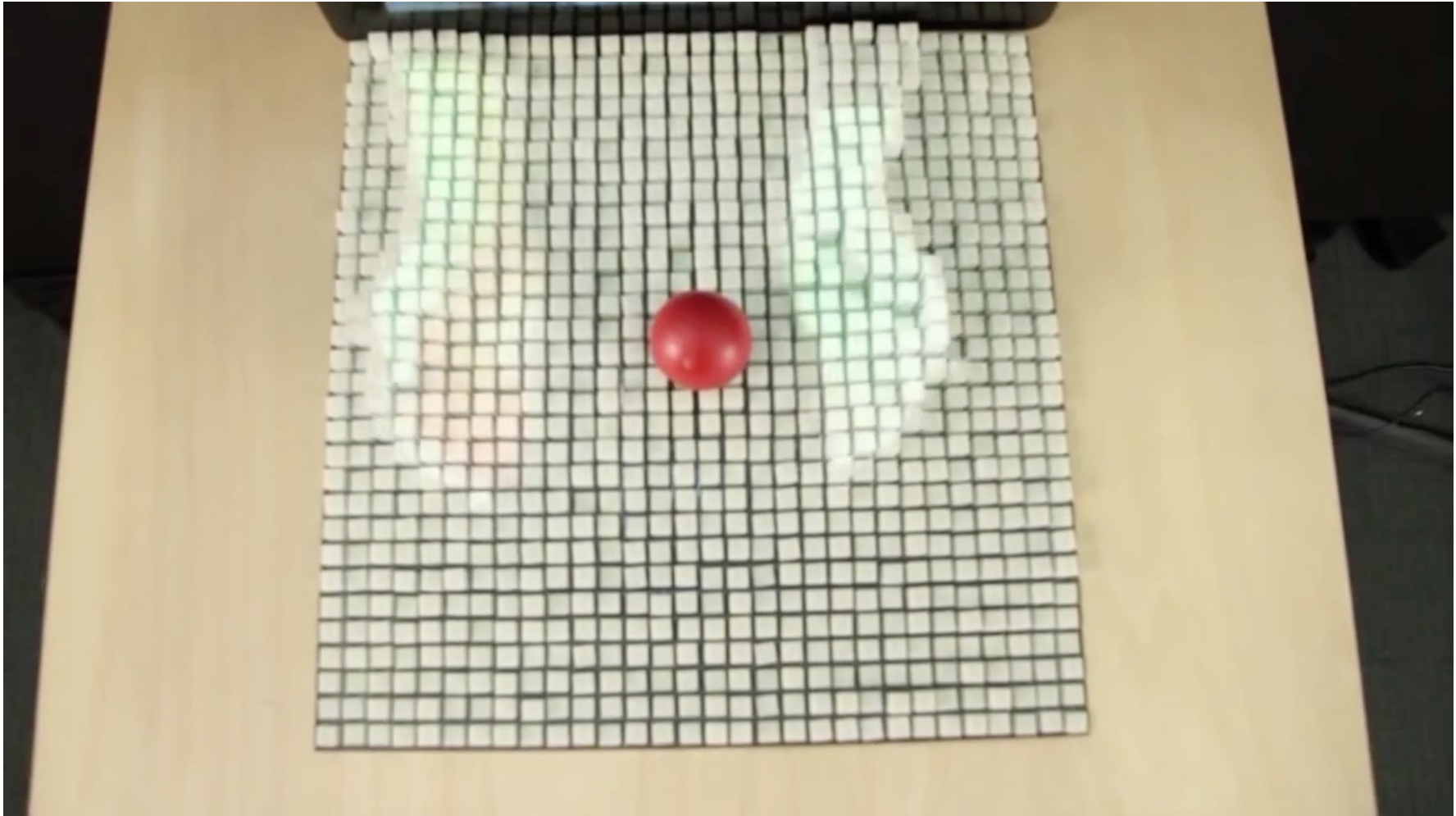


Sungjune Jang et al., CHI, 2016 (accepted)



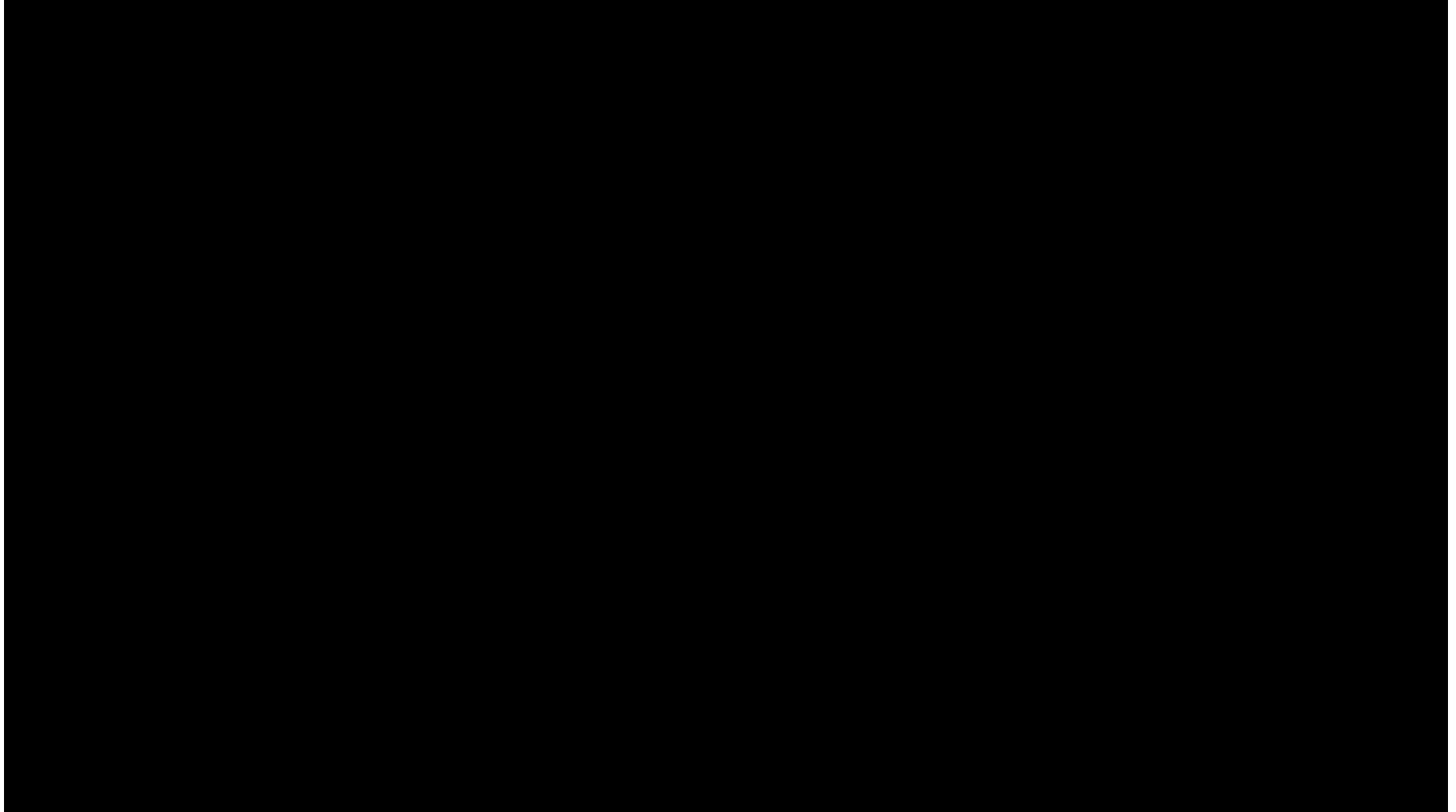
Shape Changing in AR

inFORM (Leigthinger, Follmer, Ishii, et al. MIT Tangible Media Group)



<https://www.youtube.com/watch?v=ouP9xNujkNo>

Emotional interfaces



[Camy: Pet dog analogy](#)

see also: [Vector](#), [Goosebumps](#)

Touch and emotional interfaces

POKE (Park et al., KAIST)

The Roles of Touch during Phone Conversations:
Long-Distance Couples' Use of **POKE** in Their Homes

Young-Woo Park, Kyoung-Min Baek, Tek-Jin Nam
Department of Industrial Design, KAIST
{pyw, km.baek, tjnam}@kaist.ac.kr



https://www.youtube.com/watch?time_continue=11&v=Fhn2NwJgZ3c

Touch and micro-robots

MobiLimb (Teyssier et al, Télécom Paris, Sorbonne Univ.)



MobiLimb

Actuated Skeleton for Mobile Augmentation

<https://marcteyssier.com/projects/mobilimb/>

Artificial "Skin"

Skin-On (M. Teyssier et al, Télécom Paris, Sorbonne Univ., Bristol Univ.)



Human Augmentation

Hand Development Kit (Sang Leigh et al., MIT Media Lab)



Micro-Robots

Zoids (Le Goc et al, INRIA, Stanford, Paris-Sud)



Micro-Robots



On Body Robots (Dementyev et al., MIT Media Lab)

Rovables: Miniature On-Body Robots as Mobile Wearables

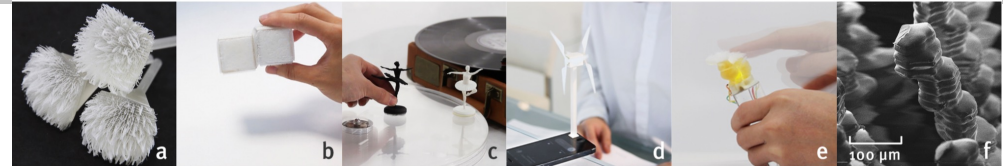
Artem Dementyev, Hsin-Liu (Cindy) Kao, Inrak Choi, Deborah Ajilo, Maggie Xu, Joseph Paradiso, Chris Schmandt, Sean Follmer

MIT Media Lab, Stanford University

UIST 2016

New Materials / 3D Printing

Cillia (Ou et al., MIT Tangible Media)



Cillia

3D Printed Micro-Pillar Structures for Surface Texture, Actuation and Sensing

New Materials / 3D Printing

ExoSkin: On-Body Fabrication (Gannon et al., Autodesk, Atonaton)



Body Interaction

Skinput [Harrison et al. 10]

Skintrack [Zhang et al. 16]

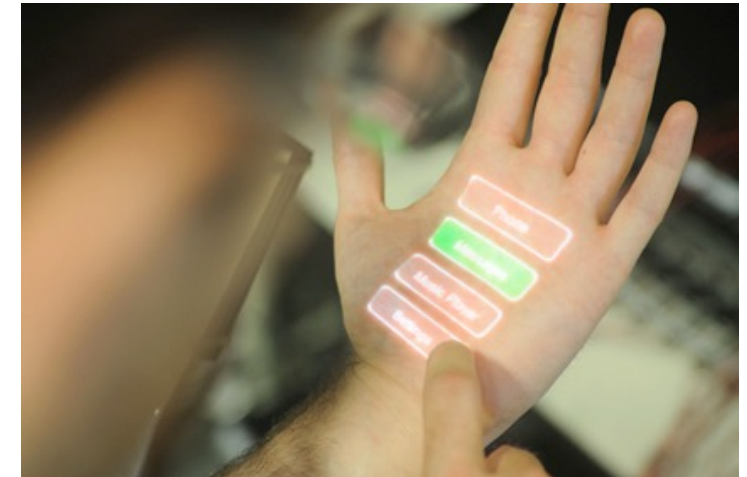
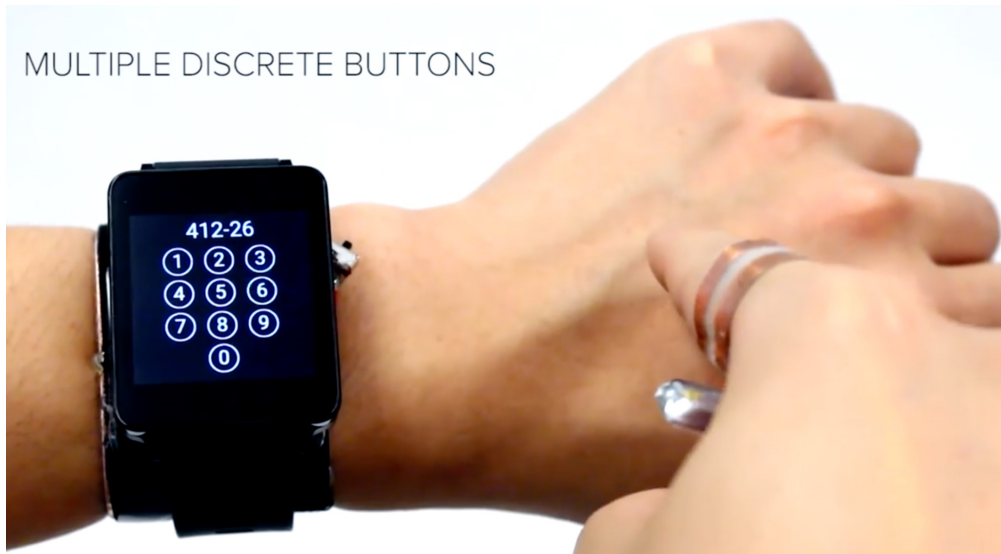
FingerIO [Nandakumar et al. 16]

iSkin [Weigel et al. 15]

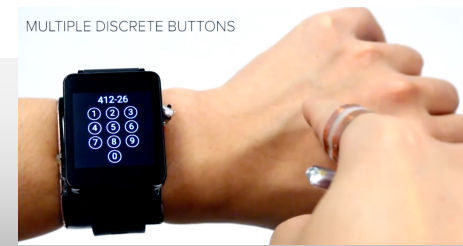
Body-centric Design Space [Wagner et al. 13]



MULTIPLE DISCRETE BUTTONS



Body Interaction



Skintrack (Zhang et al. 16, Carnegie Mellon)



<https://www.cmu.edu/news/stories/archives/2016/may/skintrack-technology.html>

Proxemic Interaction

Proxemic interactions (Ballendat et al. Calgary Univ.)



Continuously
revealing
more
information
while
approaching
the display

Proxemic Interactions The Video

Designing for a Proximity
and Orientation-Aware Environment

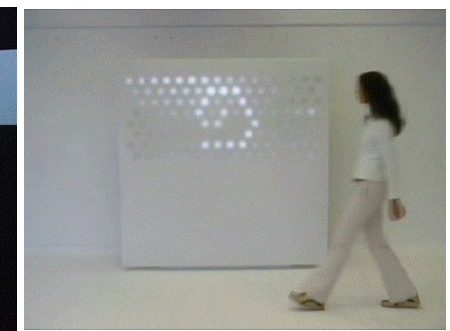
Till Ballendat, Nicolai Marquardt, Saul Greenberg

Interactions Lab
University of Calgary

<https://www.youtube.com/watch?v=OHm9teVoNE8>

Ambient Interaction

Ambient Agoras (Franhauser IPSI)



GossiPlace

