

# Input and Interaction

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CS 376





# Skinput



Recall: Omnitouch



A man with glasses and a blue and white striped shirt is sitting in an office. He is holding a black device in his hands. The background shows a desk with a computer monitor, a chair, and a window with blinds. A semi-transparent grey bar is at the bottom of the image.

Recall: SenseCam

# Input and interaction research

- How can the user interact fluidly with the world around them?
  - New input modalities: e.g., depth cameras
  - New output modalities: e.g., pico projectors
  - New user vocabulary: e.g., gestures
- This research is often driven by, or involves the creation of, new hardware



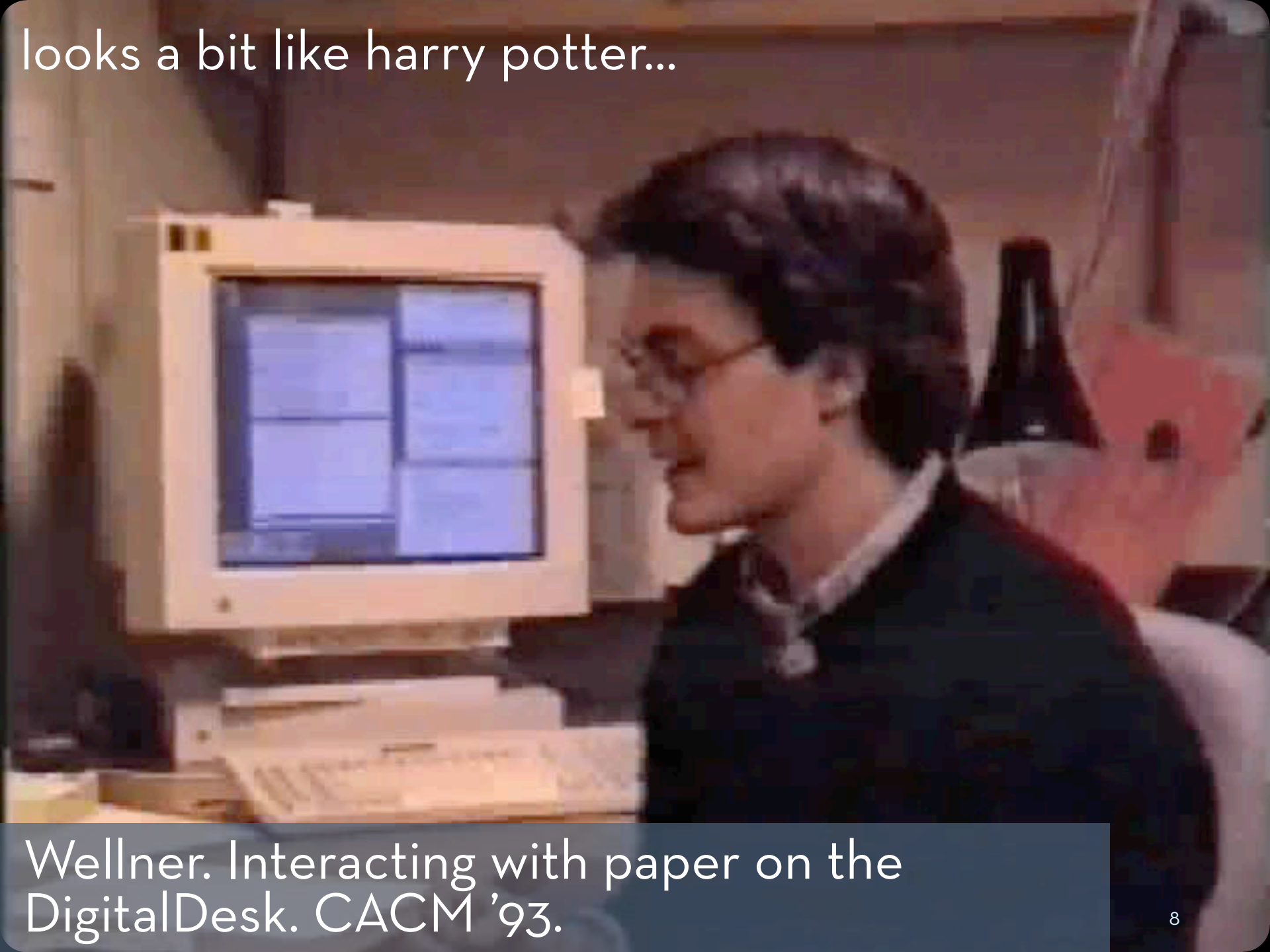
Bolt. "Put-that-there": Voice and gesture at the graphics interface. SIGGRAPH '80.

# Put That There

- Contribution: combined gesture and voice input
  - In a closed world
  - With a toy goal
  - Using simple manipulation operations
  - Using a laser attached to the wrist
- In many ways, our goal since 1980 has been to relax those assumptions



looks a bit like harry potter...



Wellner. Interacting with paper on the DigitalDesk. CACM '93.

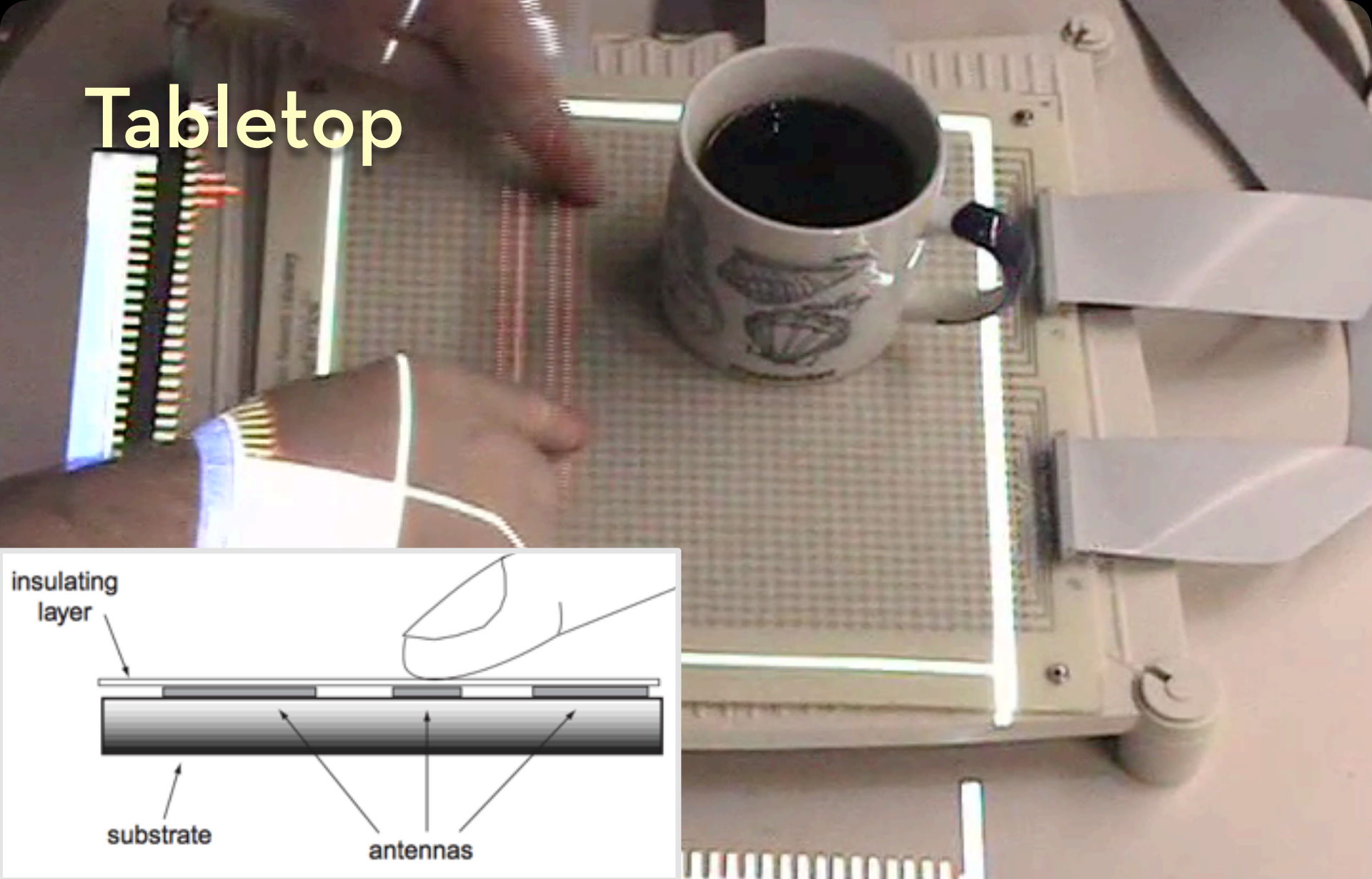


# DigitalDesk

- Contribution: fluid boundaries between digital and physical objects
  - In a constrained space
  - On a small set of tasks
  - With predefined behaviors
- Again, we work to relax these assumptions

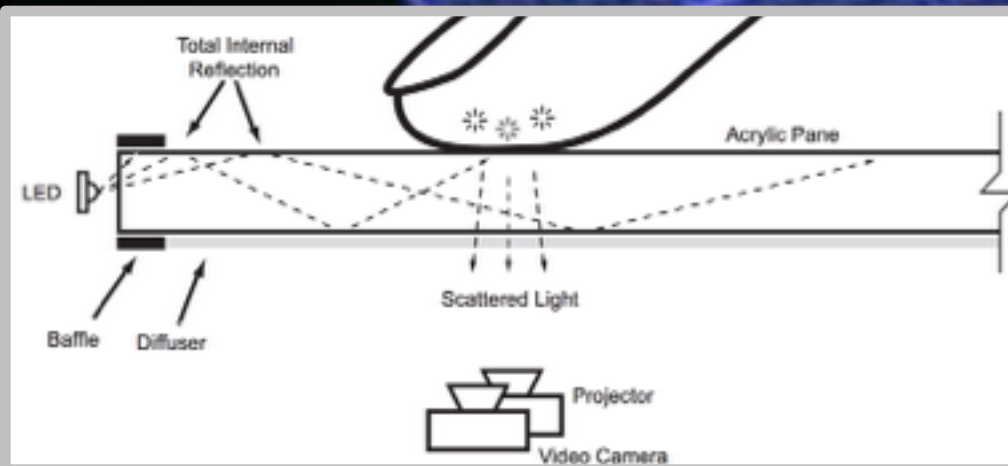
# Input technologies

# Tabletop



Dietz and Leigh. DiamondTouch: a multi-user touch technology. UIST '01.

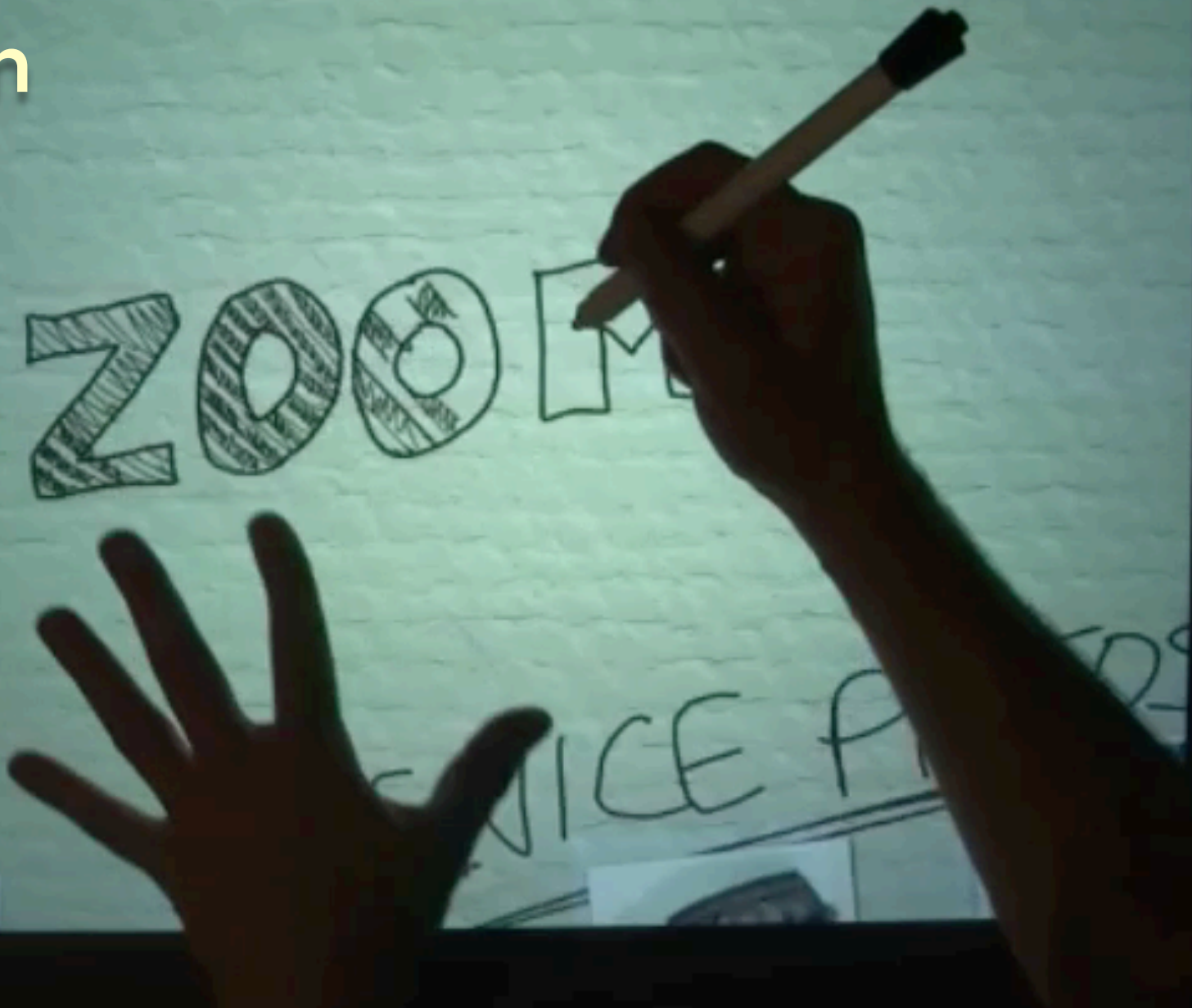
# Tabletop



Han. Low-cost multi-touch sensing through frustrated total internal reflection. UIST '05.

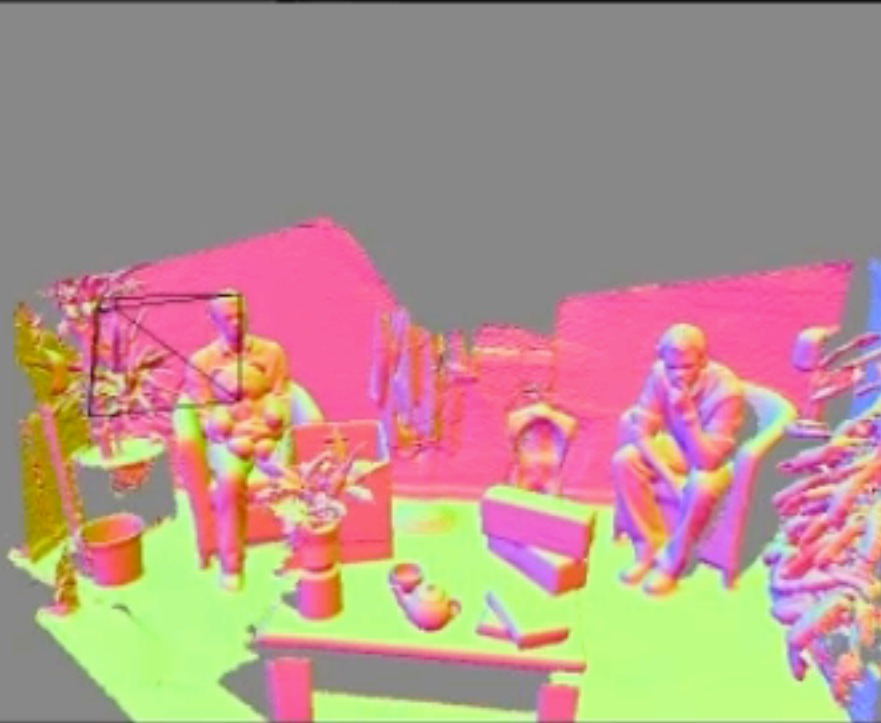


# Pen

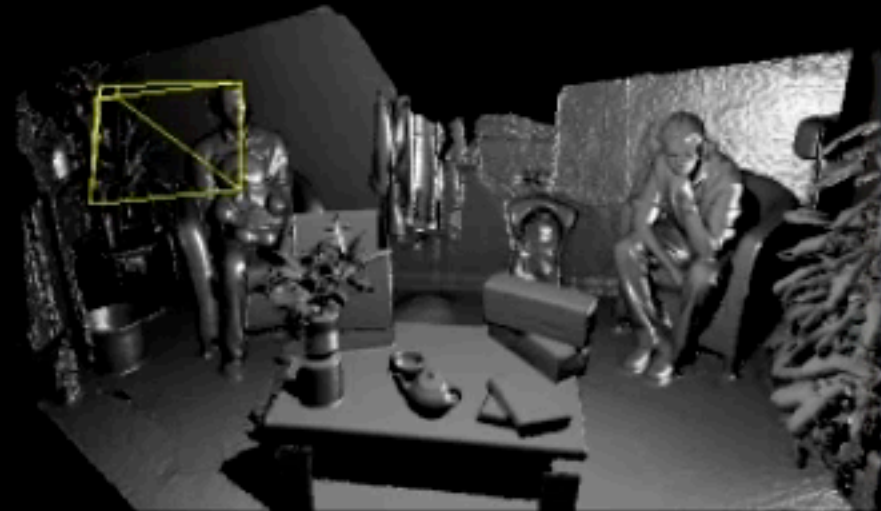


Hinckley et al. Pen + touch = new tools. UIST '10.

# Depth sensing



Model normal map



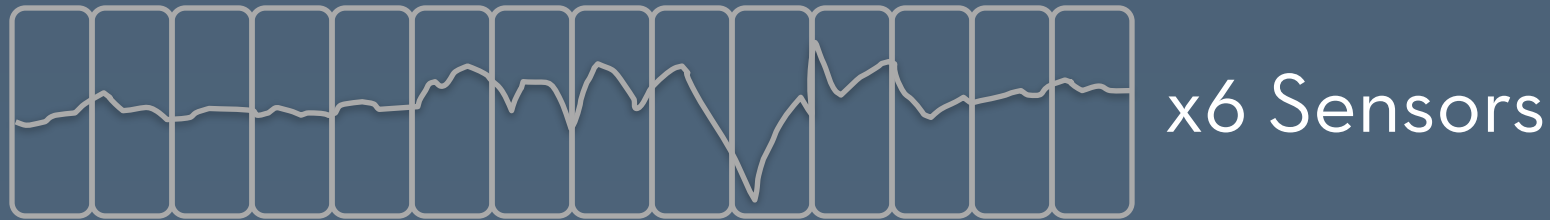
Phong shaded model

# Sensing biosignals

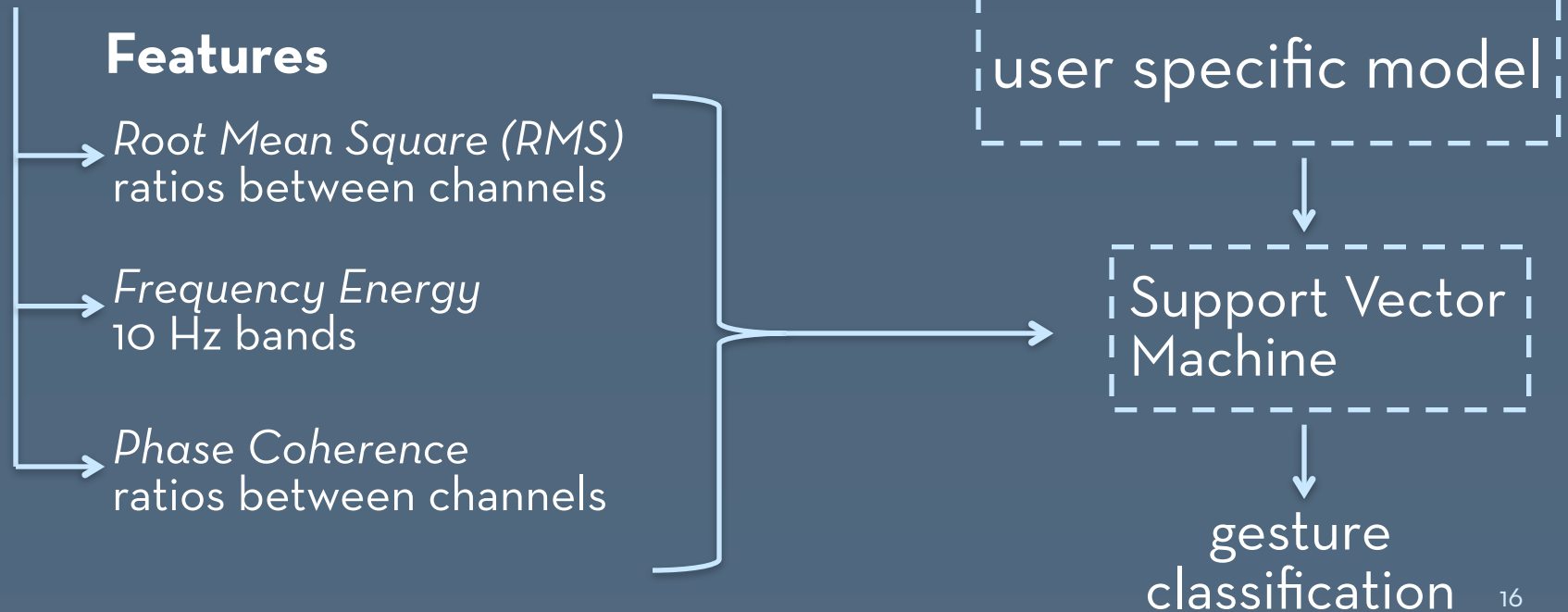


Saponas et al. Enabling Always-Available Input with Muscle-Computer Interfaces. UIST '09.

# Machine learning model for muscle interfaces et al.



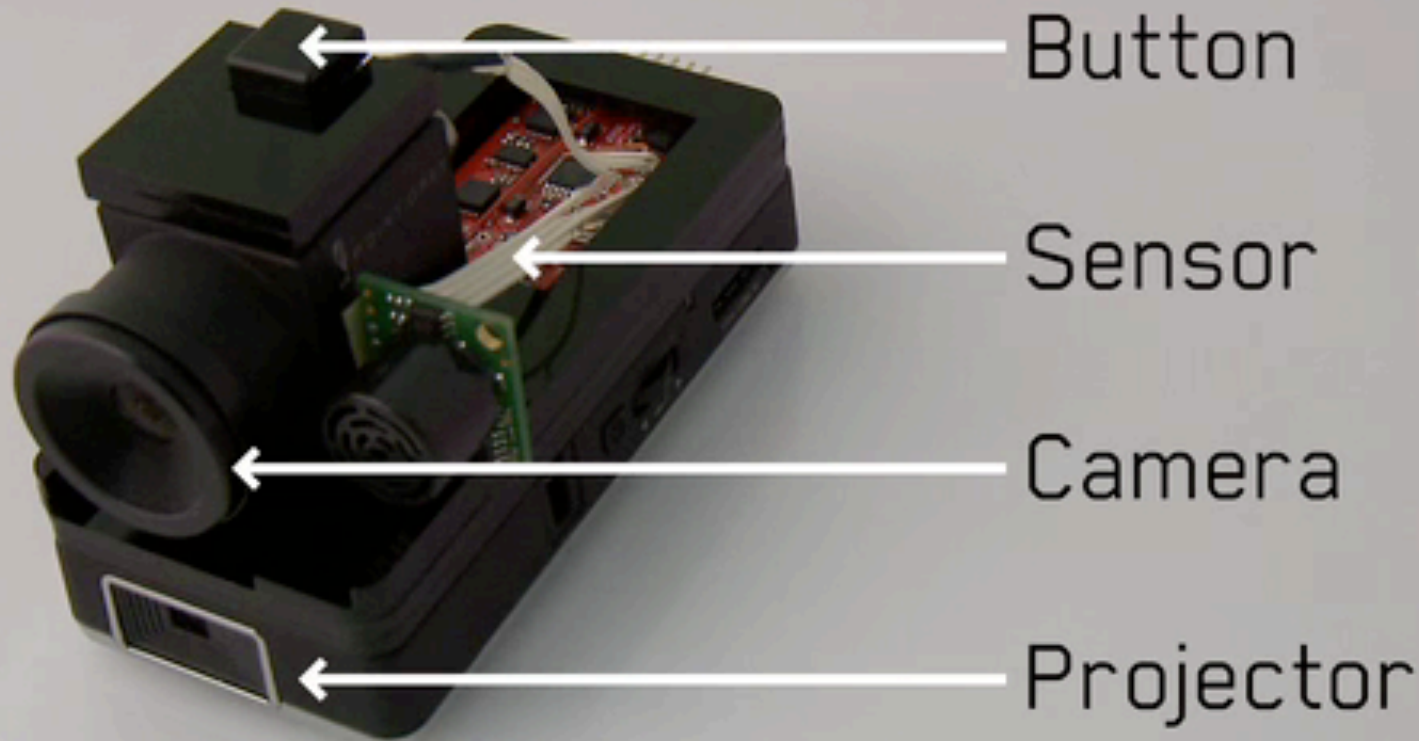
30 millisecond sample





# Output technologies

# Handheld projectors



Willis et al. SideBySide: ad-hoc multi-user interaction with handheld projectors. UIST '11.

# Physically actuated material

A close-up photograph showing a person's hands holding a white, flexible, segmented material. The material is composed of several interconnected segments, each with a small, dark, circular feature. A metal band is wrapped around the middle of the material. The person's hands are positioned to show the material's flexibility and how it can be actuated. The background is a plain, light-colored surface.

Follmer et al. Jamming user interfaces: programmable particle stiffness and sensing for malleable and shape-changing devices. UIST '12.

# Magnetic levitation

A hand is shown holding a small, reflective metal sphere. The sphere is positioned above a glowing, circular area on a table, which appears to be the source of the magnetic field. The background is dark and out of focus.

Lee, Post and Ishii. ZeroN: mid-air tangible interaction enabled by computer controlled magnetic levitation. UIST '11.



# Projectors



Projector

Pan-Tilt Platform

Kinect Sensor

Wilson et al. Steerable augmented reality with the Beamatron. UIST '12.

# 3D printing



Willis et al. Printed Optics: 3D Printing of Embedded Optical Elements for Interactive Devices. UIST '12.

# Skill sets for input research

- Learn “enough to get by” in...
  - Electrical engineering
  - Mechanical engineering
  - Computer graphics
- Known techniques for research in these domains often have direct mappings onto open questions in input