



Uwe Hahne, Jonas Schild, Stefan Elstner and Marc Alexa

MULTI-TOUCH FOCUS+CONTEXT SKETCH-BASED INTERACTION



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SKETCH-BASED INTERACTION



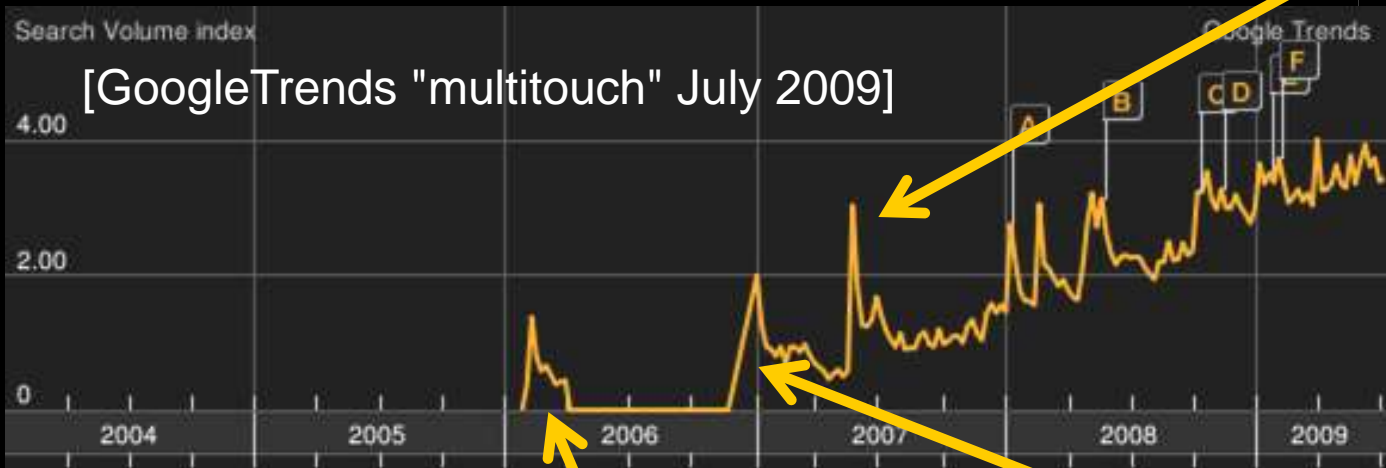
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MULTI-TOUCH FOCUS+CONTEXT SKETCH-BASED INTERACTION

Multi-touch is rising...



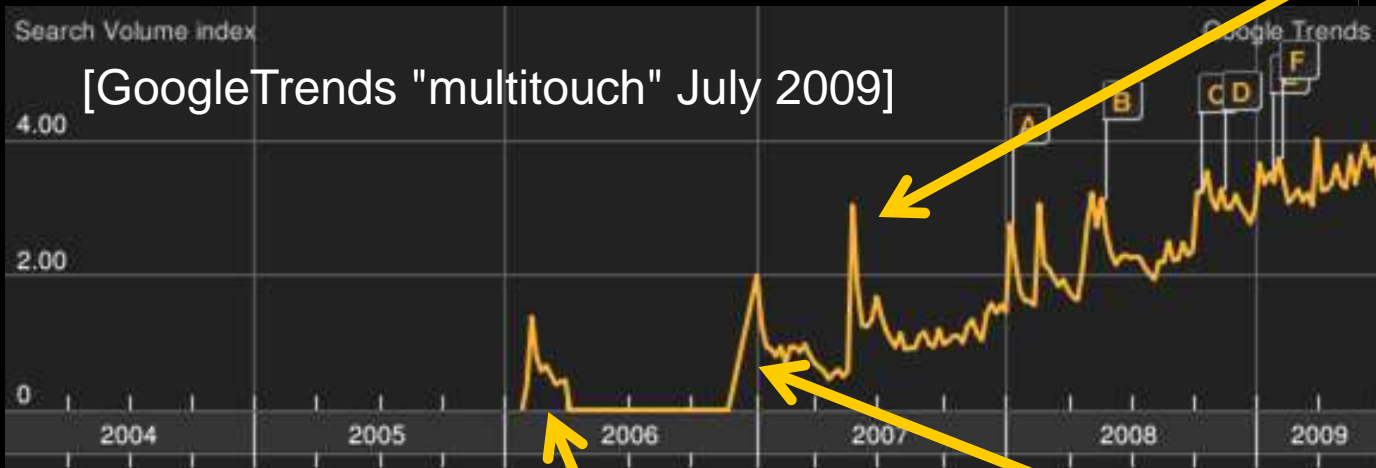
[GoogleTrends "multitouch" July 2009]



Multi-touch is rising...



[GoogleTrends "multitouch" July 2009]



Three basic technologies

DI (direct illumination)



Capacitive sensors

FTIR (frustrated total internal reflection)



Three basic technologies

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Capacitive sensors

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Three basic technologies

DI (direct illumination)

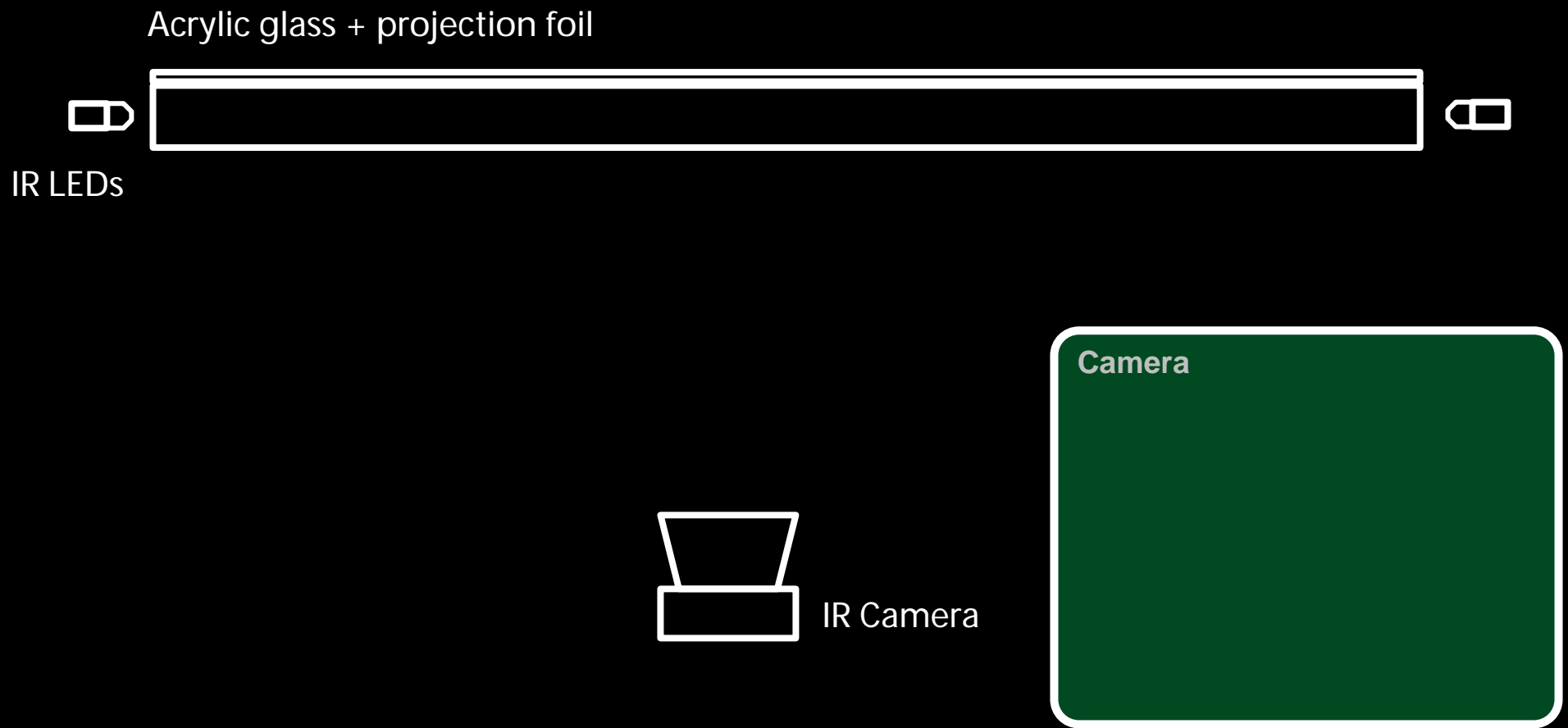


Capacitive sensors

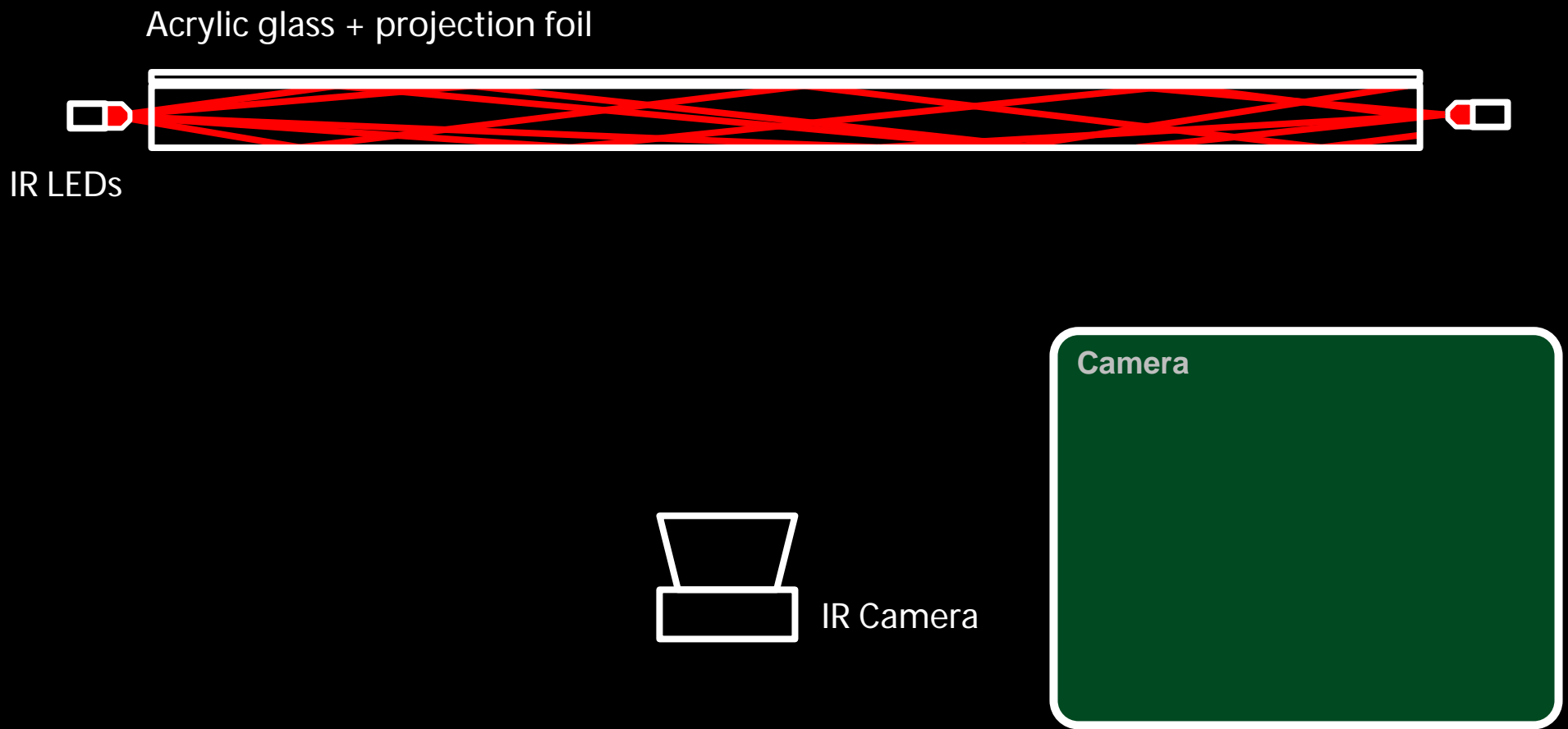
FTIR (frustrated total internal reflection)



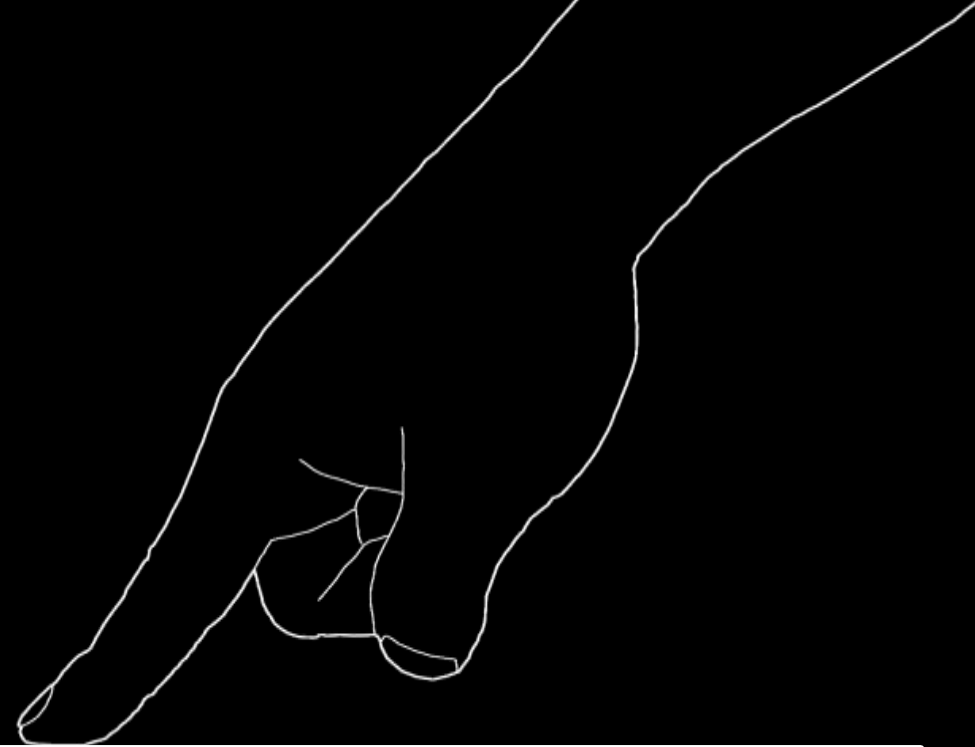
FTIR



FTIR



FTIR



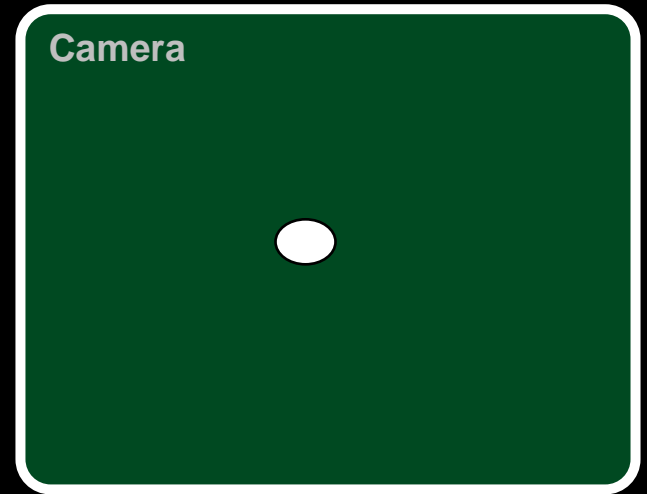
Acrylic glass + projection foil



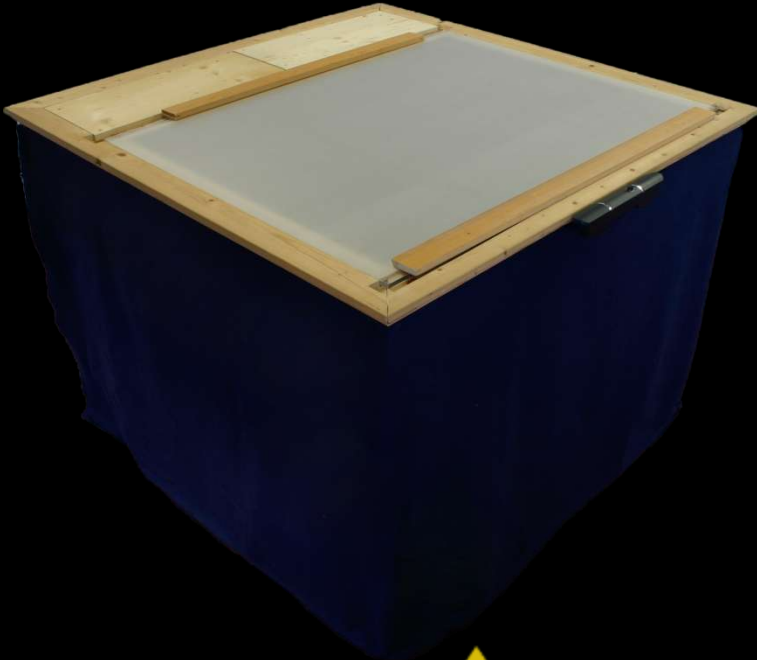
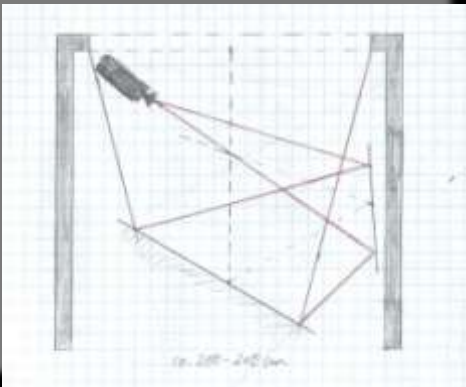
IR LEDs



IR Camera

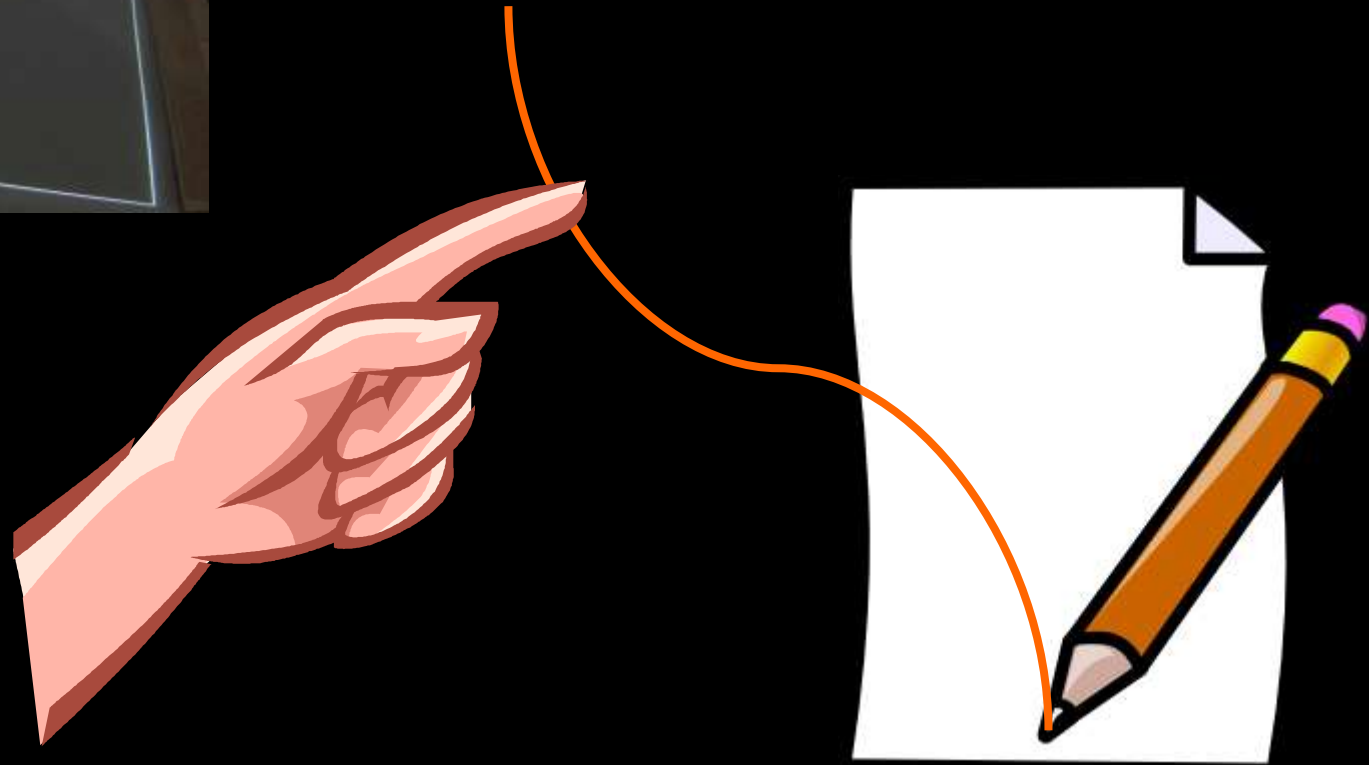


Constructing a FTIR-based multi-touch table



Drawing+Sketching

Fingers are unprecise and uncomfortable



Related work

e.g. C-Slate, N-Trigs™ DuoSense®
technology as well as FLUX support

pen and multi-touch...



FLUX@CHI09 [mi-lab.org]



N·trig™
Hands-on computing

DuoSense®



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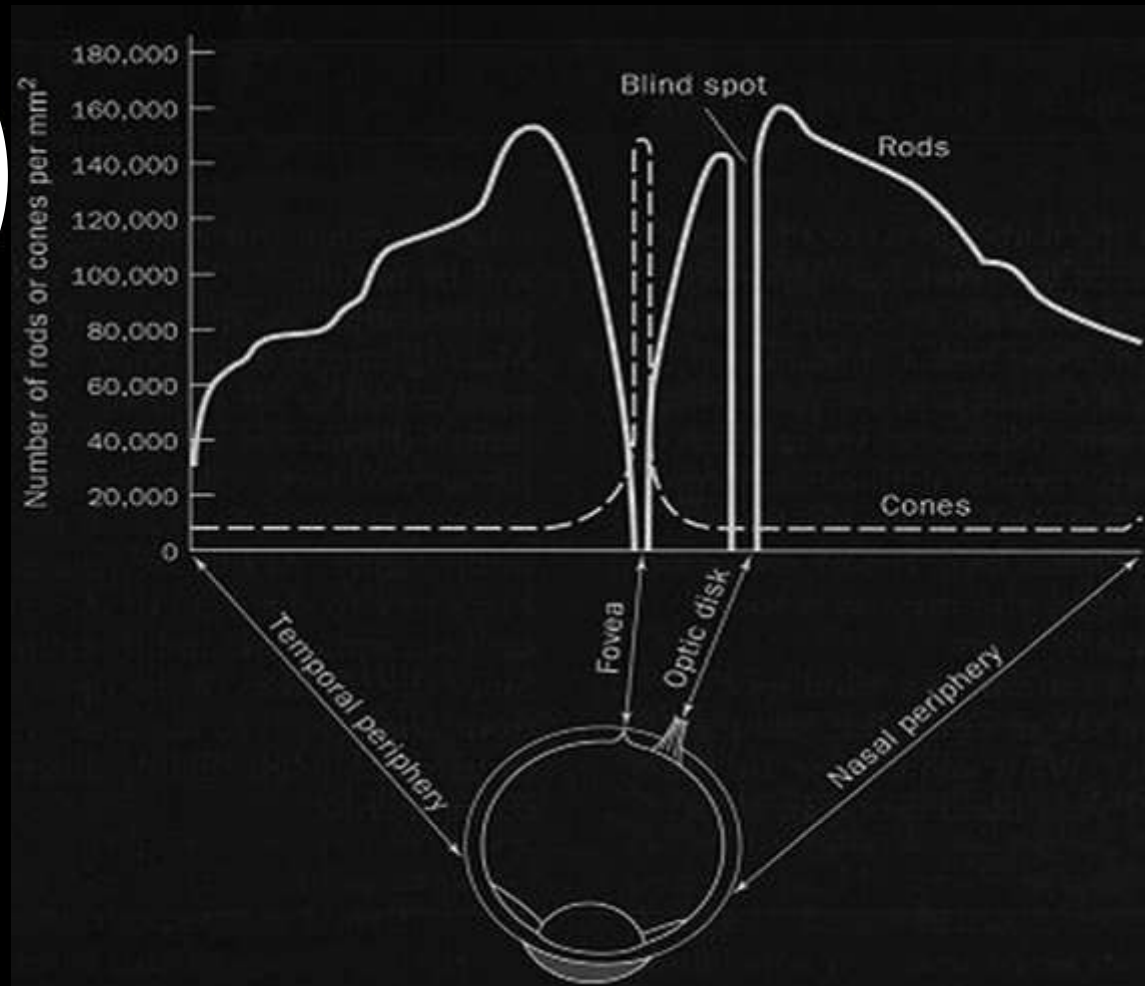
MULTI-TOUCH **FOCUS+CONTEXT** SKETCH-BASED INTERACTION

Division of Focus and Context

inspired by human visual system

related work by [Sanneblad and Holmquist]

and [Baudisch et al.]



Realizing pen and paper
on a multi-touch table...



Put a pen display on the table



Put a pen display on the table

–First add some feet



Put a pen display on the table

–First add some feet!

–Focus:

–Higher resolution than projection

–Movable

–Pen input at high precision



Put a pen display on the table

–First add some feet!

–Focus:

–Higher resolution than projection

–Movable

–Pen input at high precision

–Context:

–Multitouch surface

–Bright large scale display





Technology

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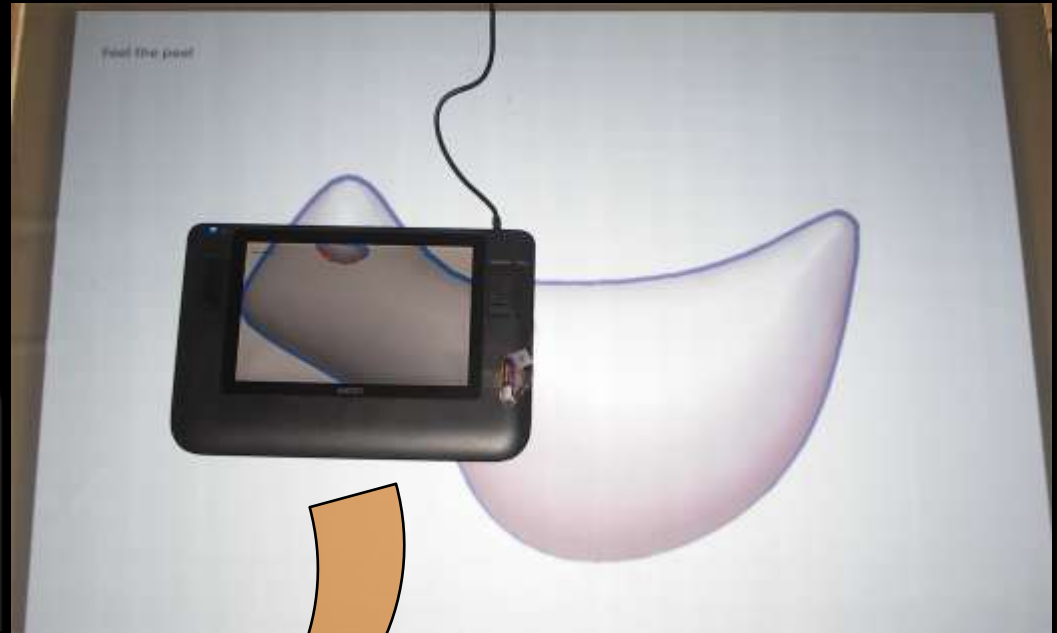
MULTI-TOUCH FOCUS+CONTEXT

SKETCH-BASED INTERACTION

Display underlying information

Tracking is necessary

Simple adaptation of the pen display

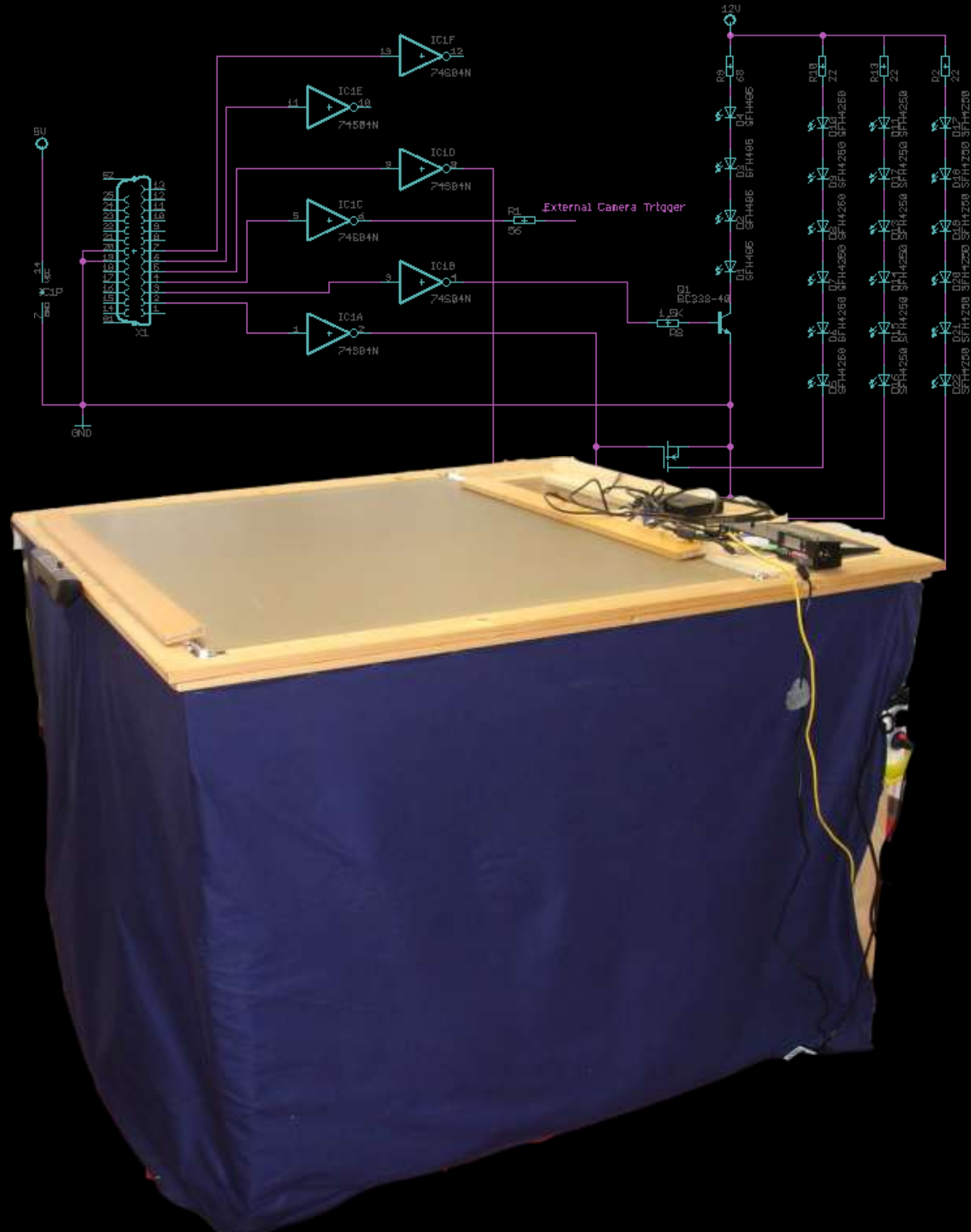
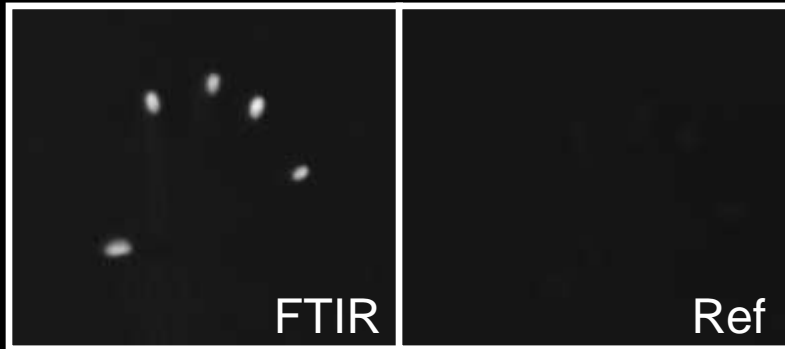
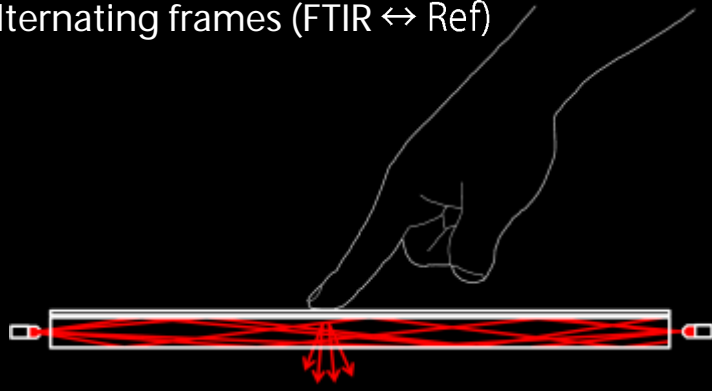


How multi-touch works in our case:

Client-Server architecture

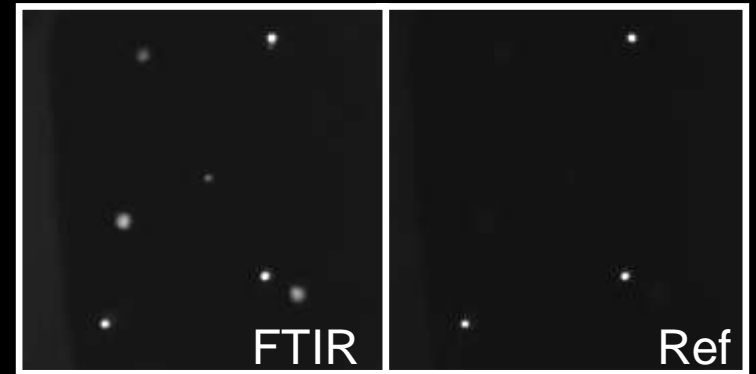
Pulsed IR illumination

Alternating frames (FTIR \leftrightarrow Ref)



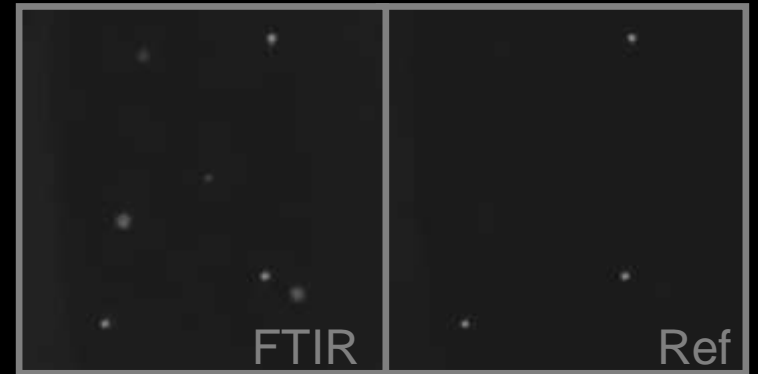
Point matching

Active markers are easy to identify in the reference image.



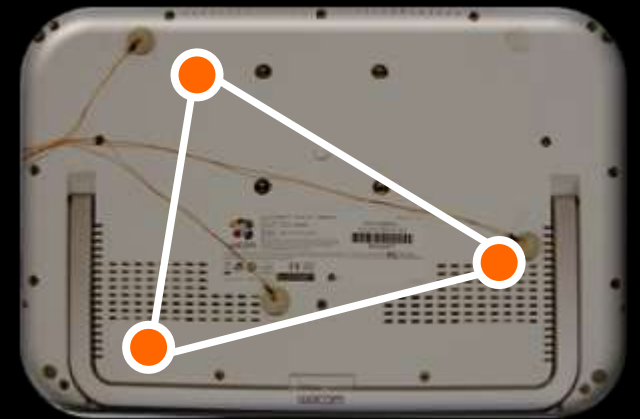
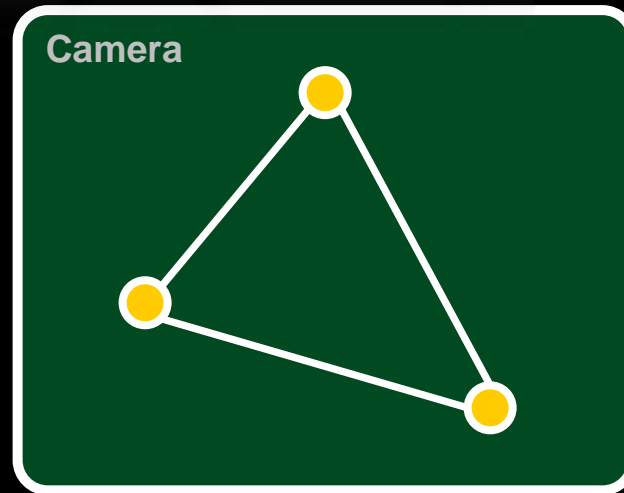
Point matching

Active markers are easy to identify in the reference image.



Matching of three points comes from the relative distances of the corners.

Three points define a rigid transformation.





Applications

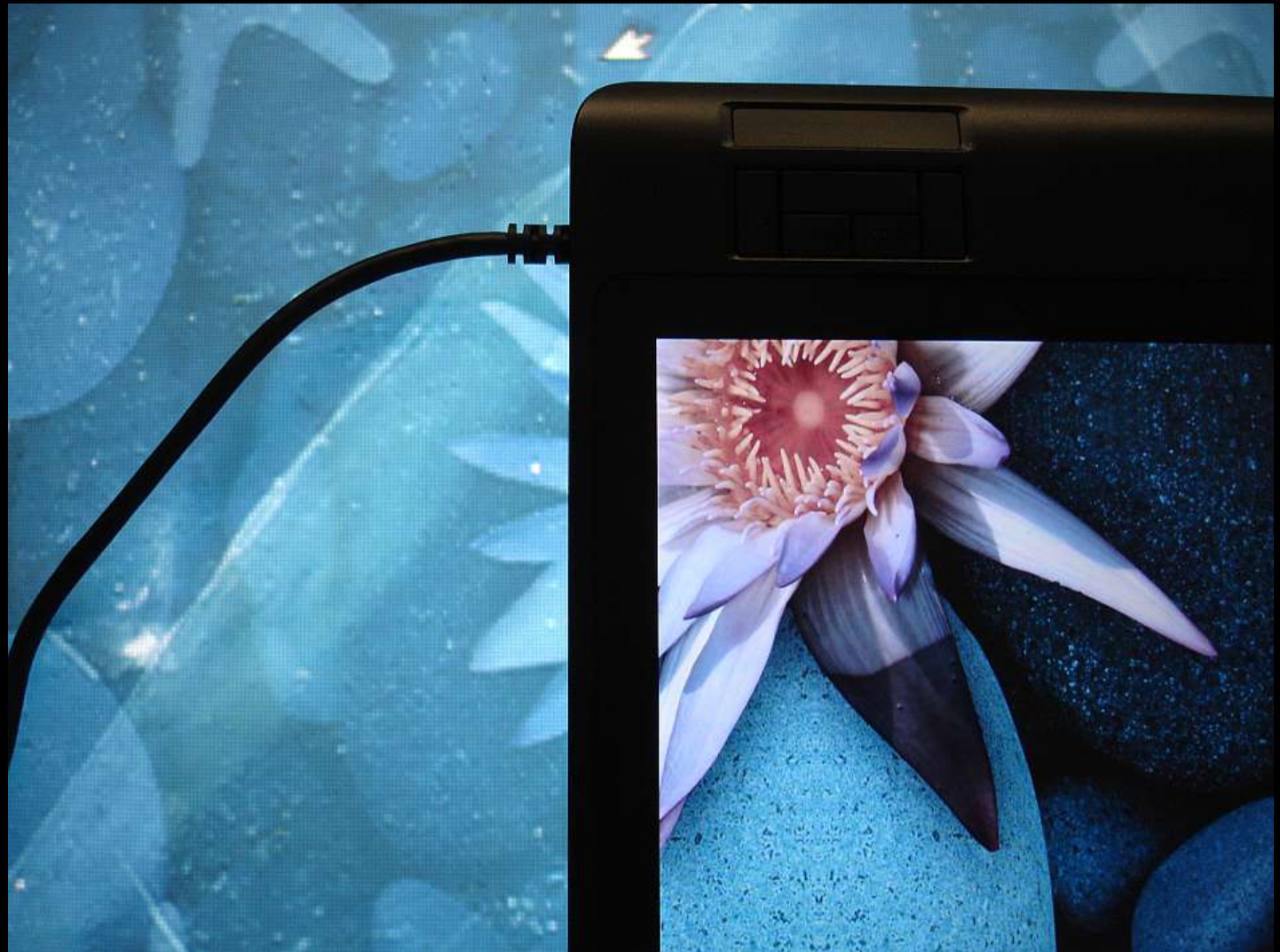
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SKETCH-BASED INTERACTION

Applications

Proof of concept with fish-tank



Interactive map application

Using the Google Earth™ API



Sketch based modeling

Focus:

- Working on details
- Exact manipulations
- Movable

Context:

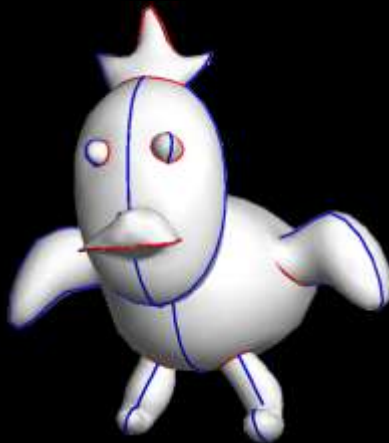
- Navigation
- Coarse sketching
- Overview



Sketch based modeling application

Based on FiberMesh [Nealen2007]

- 3D shape modelling from scratch
- Shape is defined by curves
- Manipulation with gestures



FiberMesh

Designing Freeform Surfaces
with 3D Curves

Andrew Nealen
TU Berlin

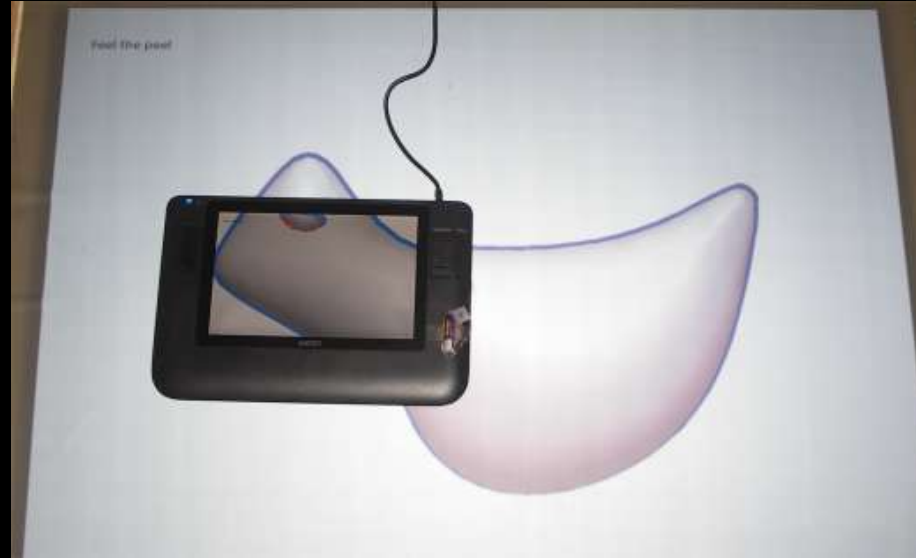
Takeo Igarashi
The University of Tokyo

Olga Sorkine
TU Berlin

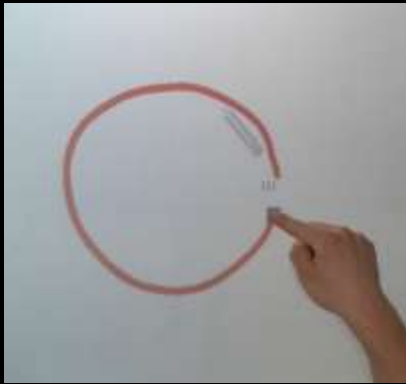
Marc Alexa
TU Berlin

FiberMesh in Focus+Context

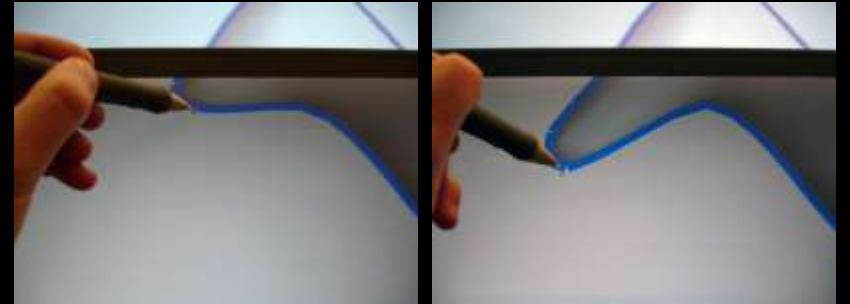
Sketching and navigating



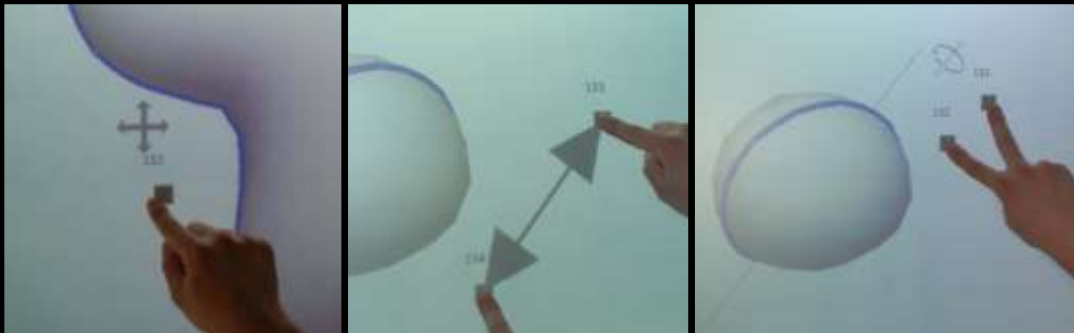
Overview



Initial sketch



Curve manipulation



Navigation: Panning -- Zoom+Z-Rotation -- Axis Rotation



Future work

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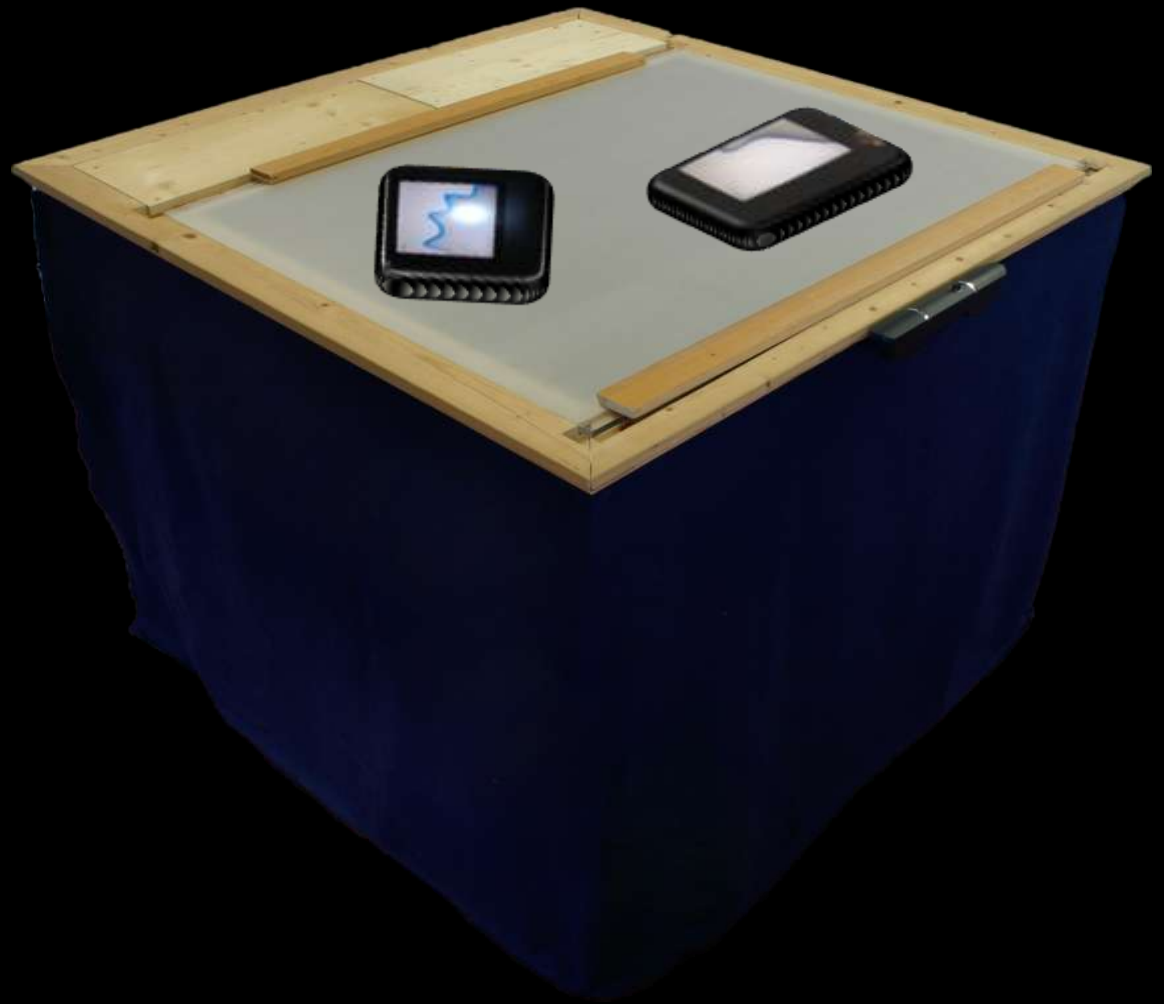
Further research

How do users act?

- Prefer they physical navigation or touch gestures?
- What happens in a multi-user setup?
- Is it disturbing being blocked from touching in Focus?

Can the Focus+Context approach succeed in public?

- Assuming public multi-touch tables everywhere...
- Which personal devices make sense to be placed on such an interactive table?



Further research

How do users act?

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- What happens in a multi-user setup?
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Can the Focus+Context approach succeed in public?

- Assuming public multi-touch tables everywhere...
- Which personal devices can support SBM when placed on an interactive table?



Thank you for listening.



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