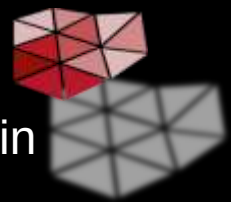
Uwe Hahne, Jonas Schild, Stefan Elstner and Marc Alexa

MULTI-TOUCH FOCUS+CONTEXT SKETCH-BASED INTERACTION

UNIVERSITÄT DUISBURG ESSEN

Computer Graphics
TU Berlin



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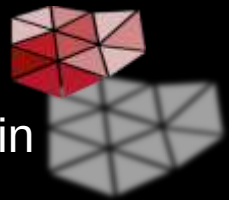

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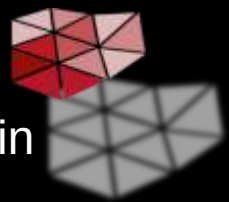
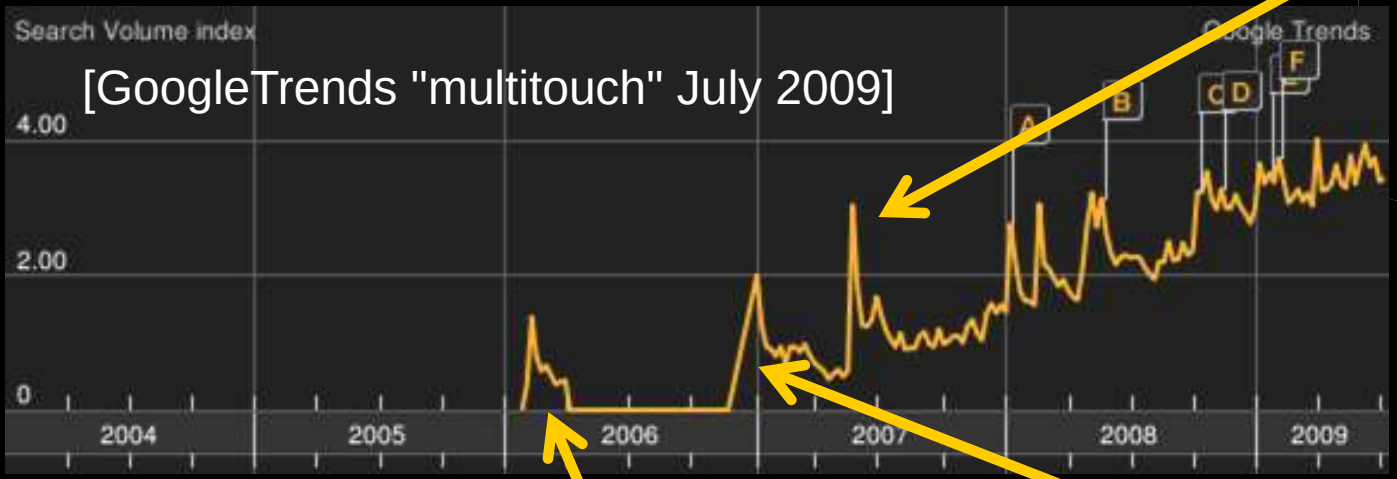
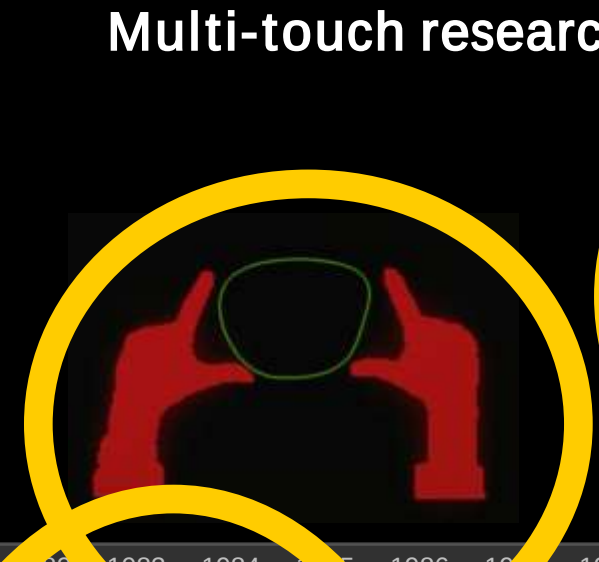


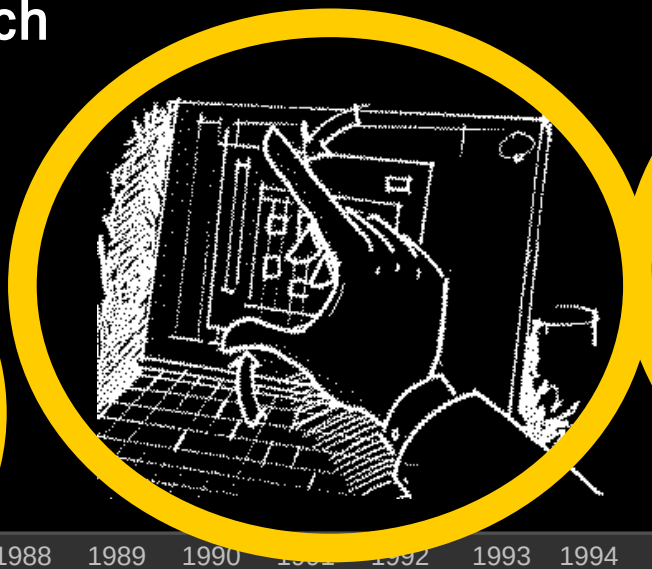
Multi-touch is rising...

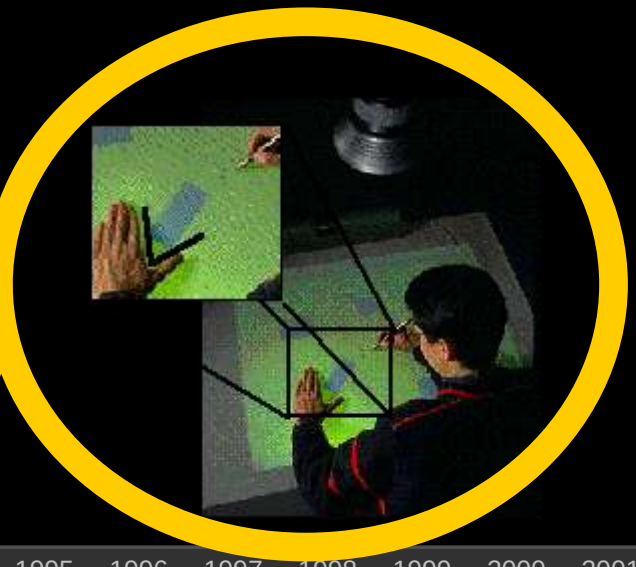


[GoogleTrends "multitouch" July 2009]

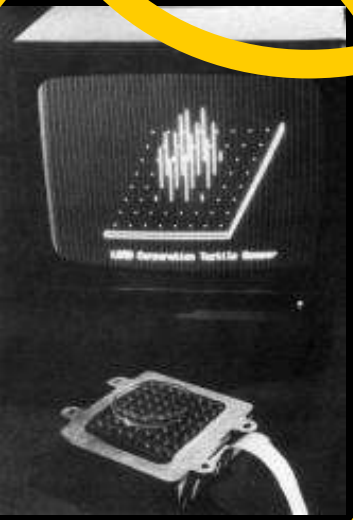
Multi-touch research

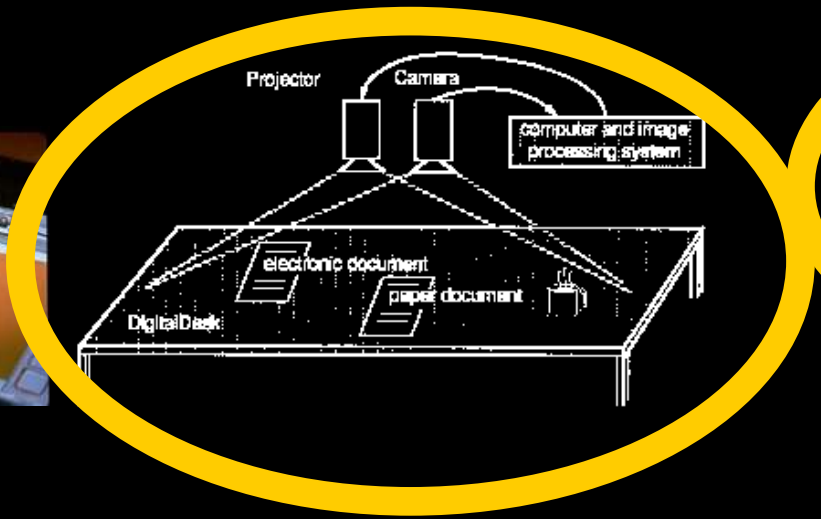






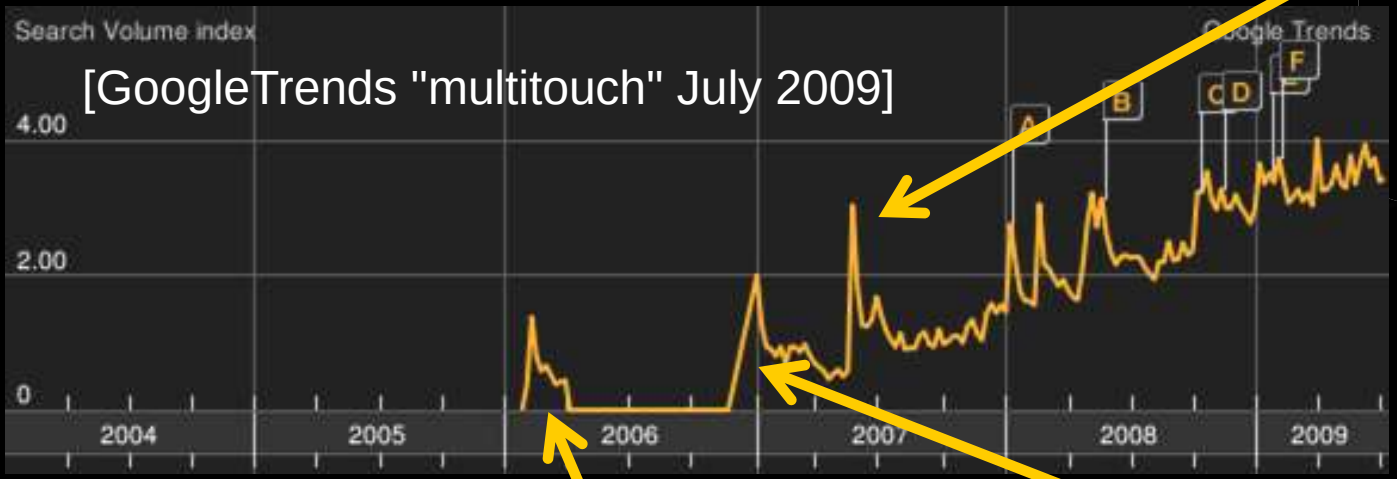
1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003





[all images from billbuxton.com]

Multi-touch is rising...



[GoogleTrends "multitouch" July 2009]

Three basic technologies

DI (direct illumination)

Capacitive sensors

FTIR (frustrated total internal reflection)

Three basic technologies

DI (direct illumination)

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FTIR (frustrated total internal reflection)

Three basic technologies

DI (direct illumination)

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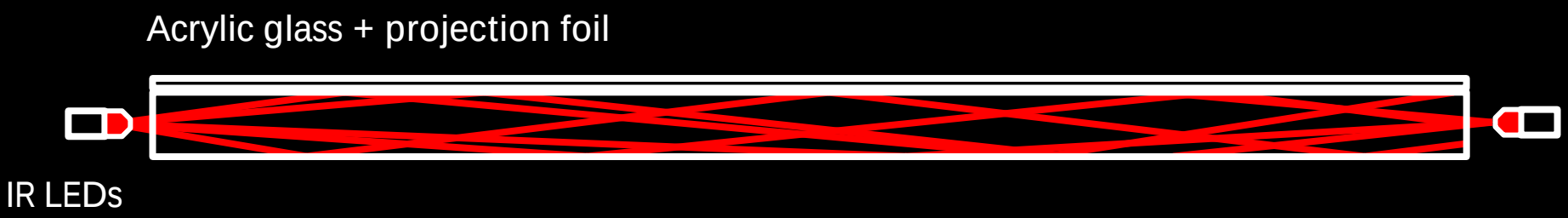
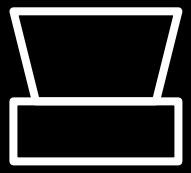
FTIR (frustrated total internal reflection)

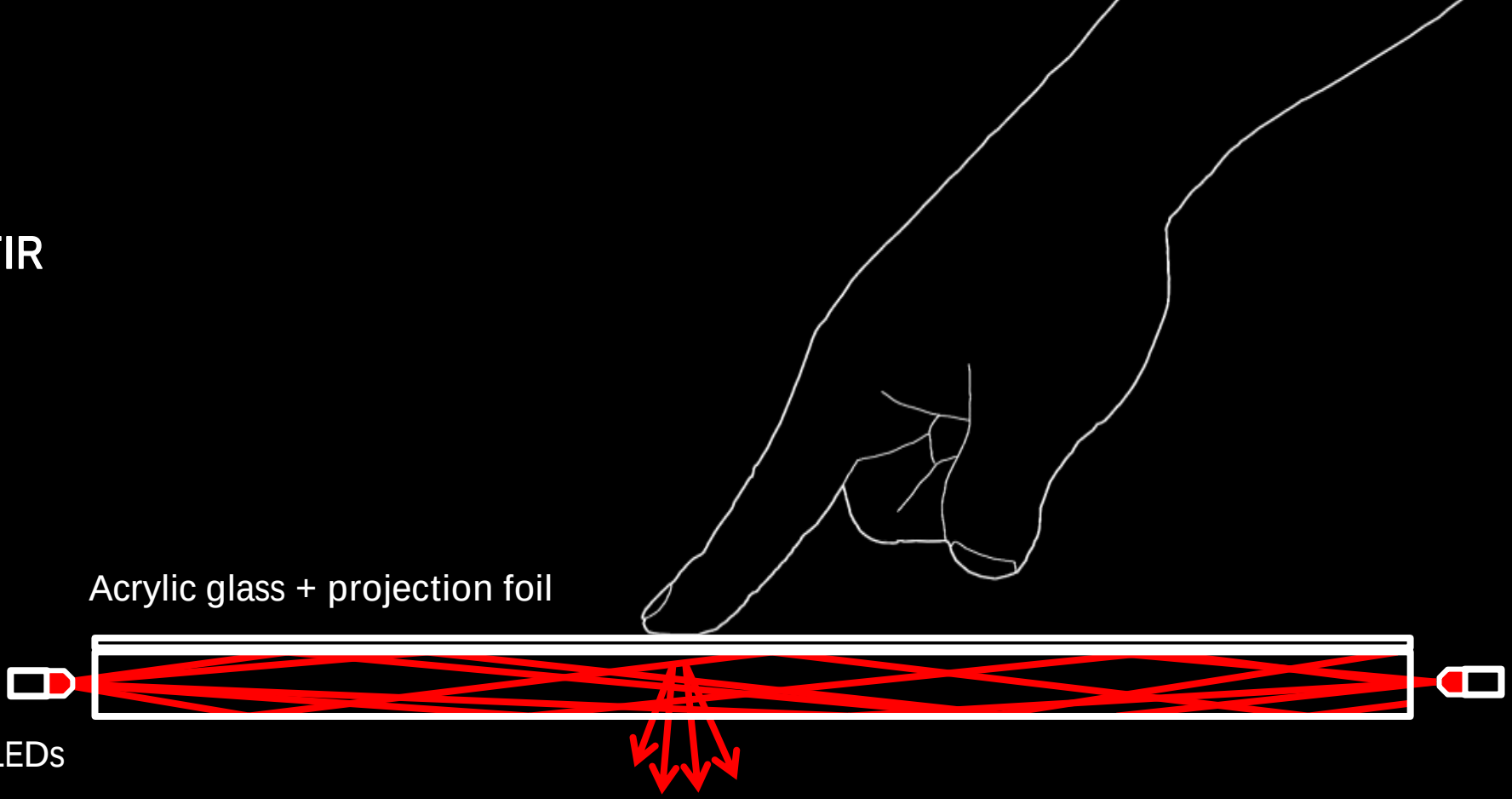
FTIR

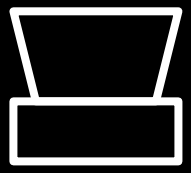
FTIR



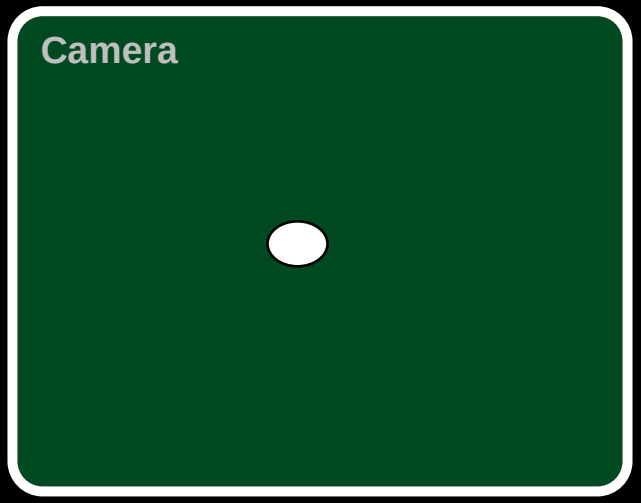


FTIR

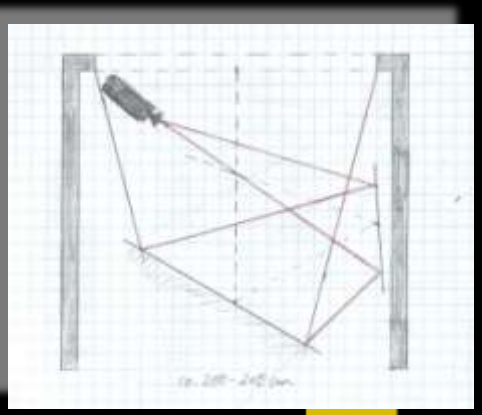




IR Camera

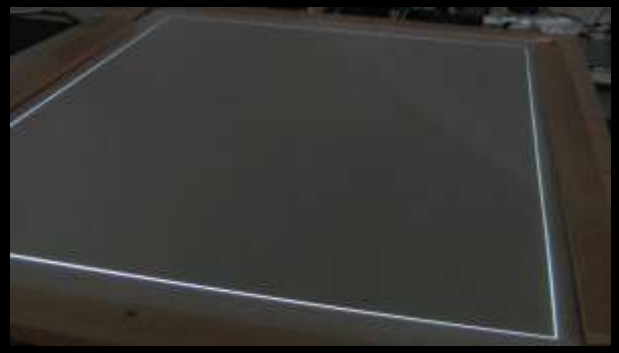


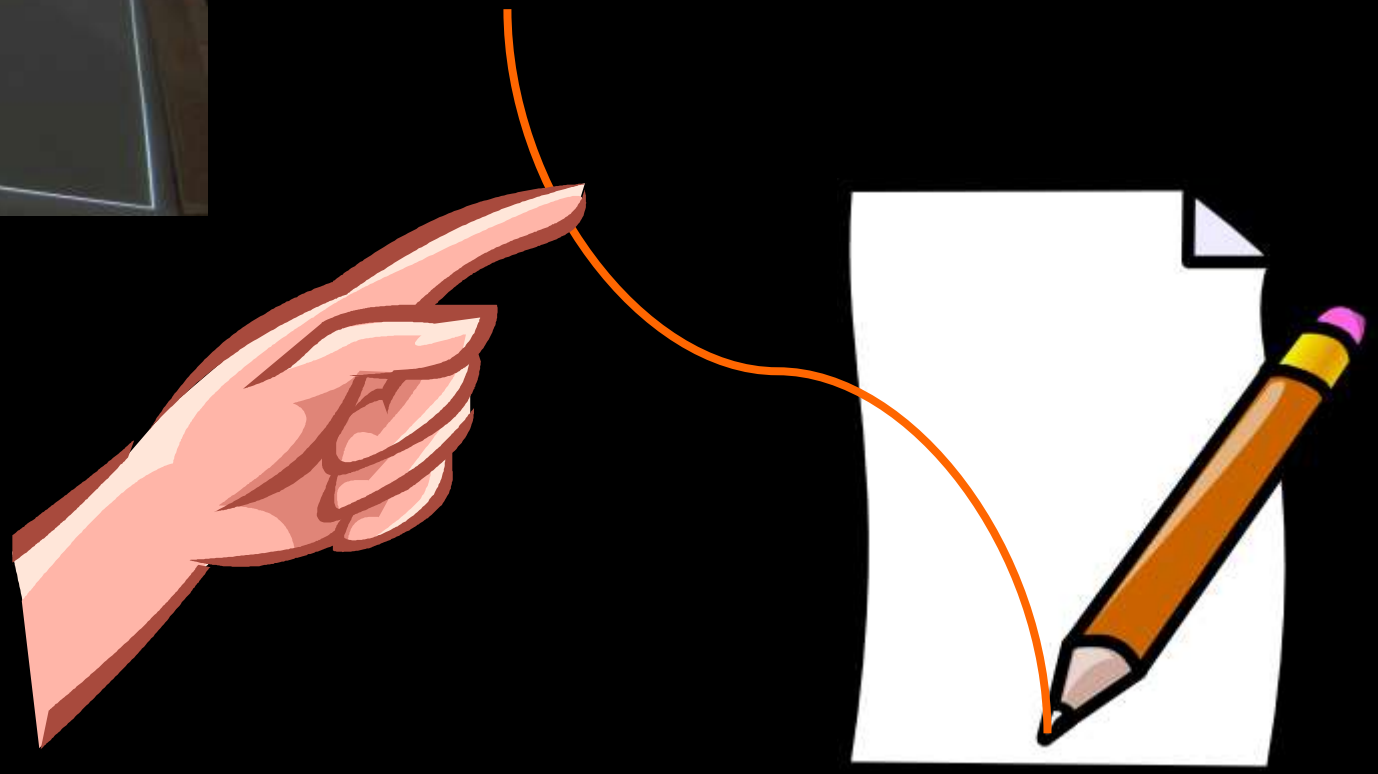
Constructing a FTIR-based multi-touch table



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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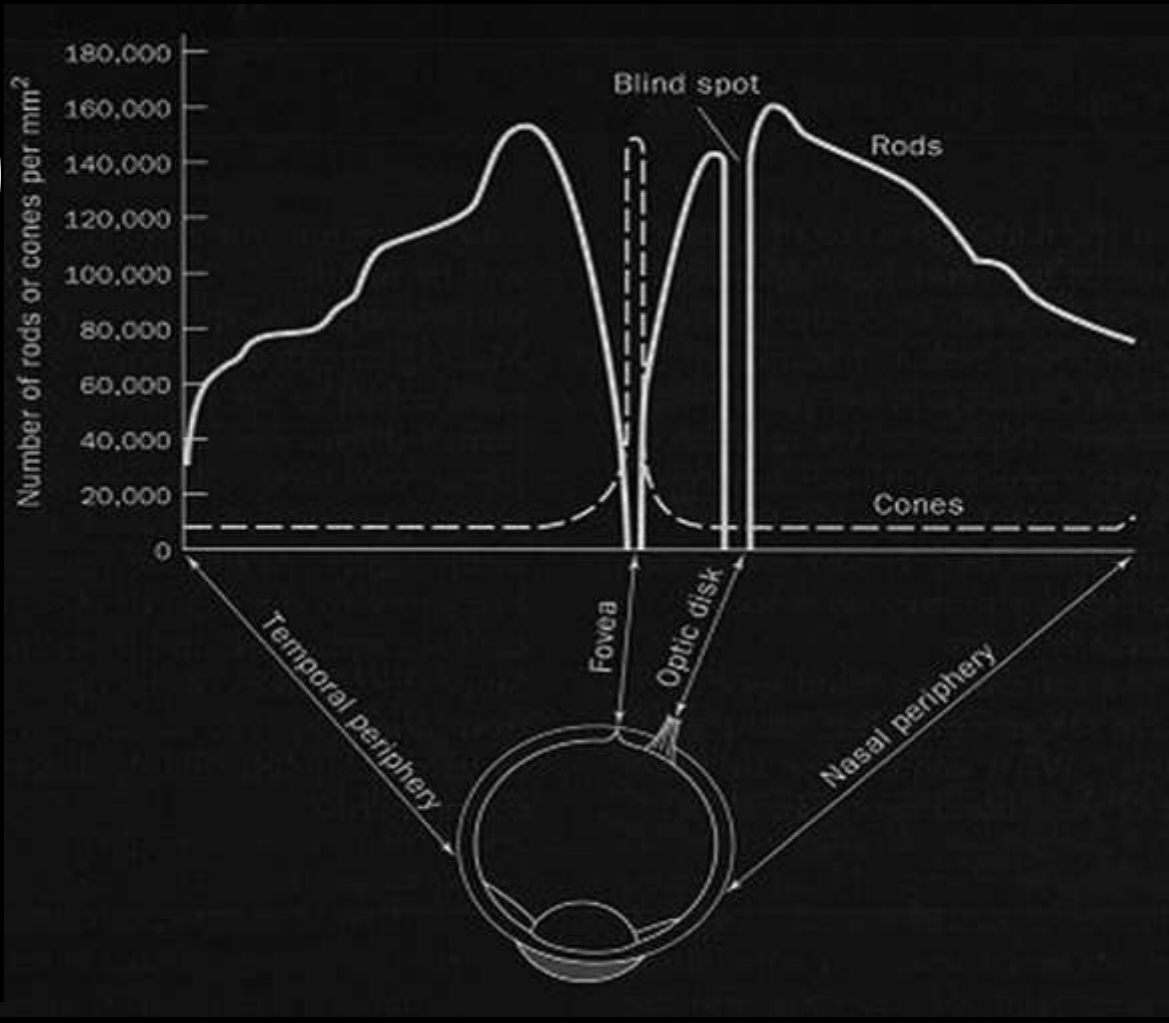
Division of Focus and Context

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 prescision

Put a pen display on the table

- First add some feet!
- Focus:
  - Higher resolution than projection
  - Movable
  - Pen input at high prescision
- Context:
  - Multitouch surface
  - Bright large scale display

Technology

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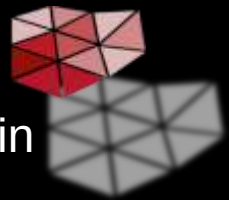
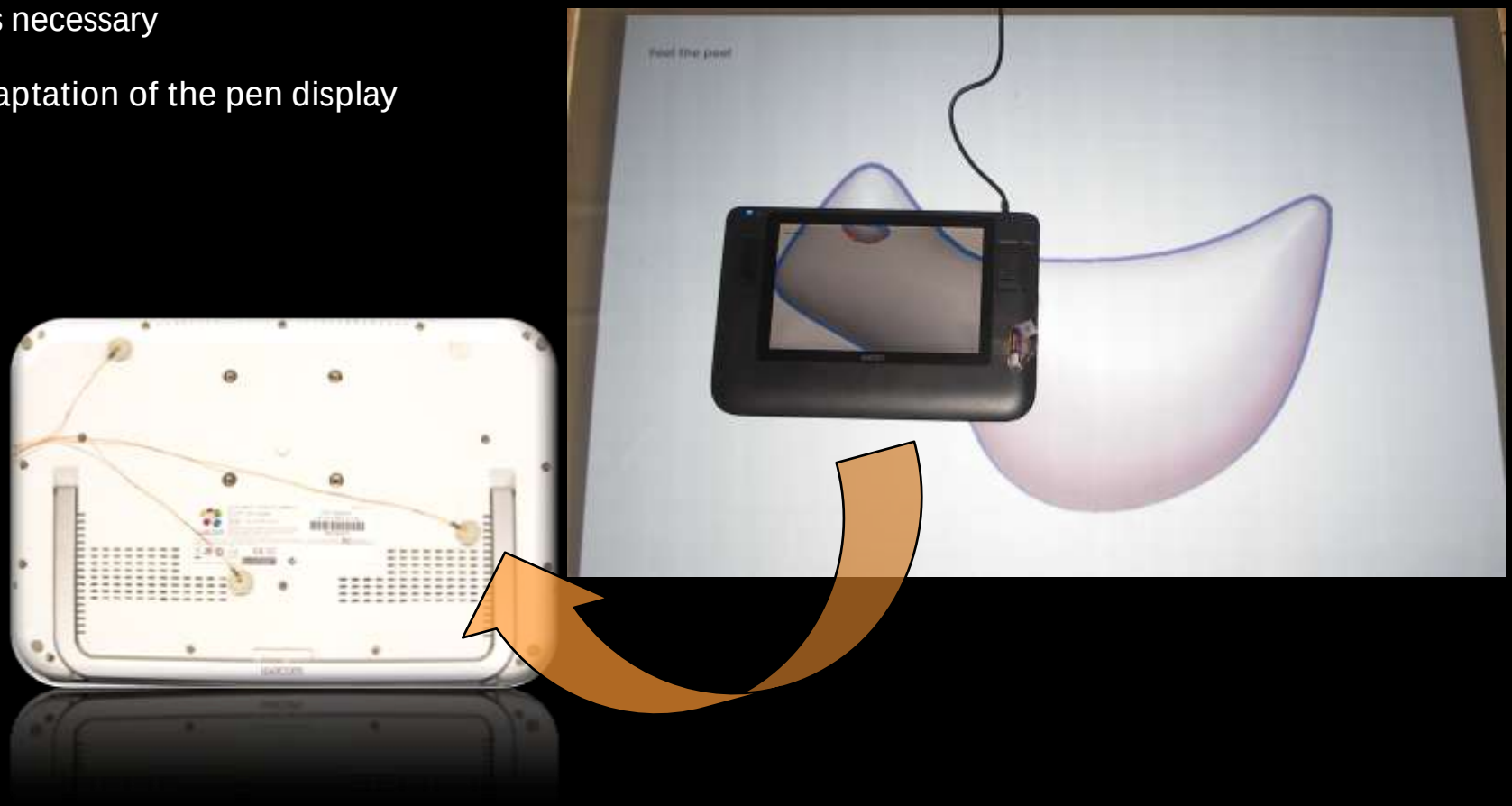


Display underlying information

Tracking is necessary

Simple adaptation of the pen display

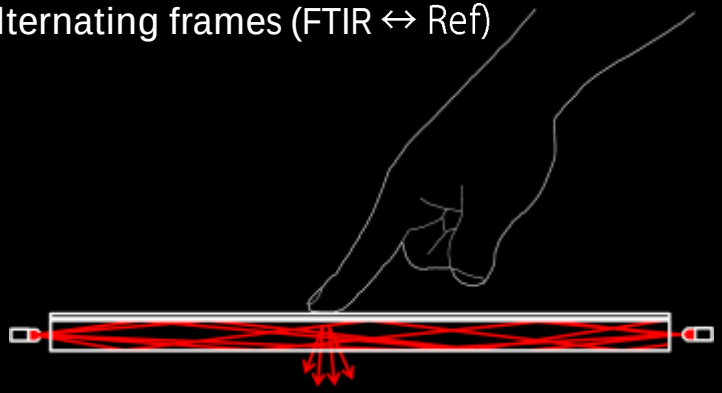


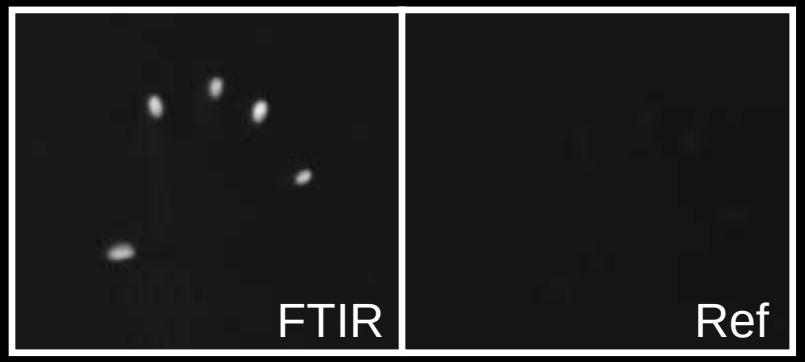
How multi-touch works in our case:

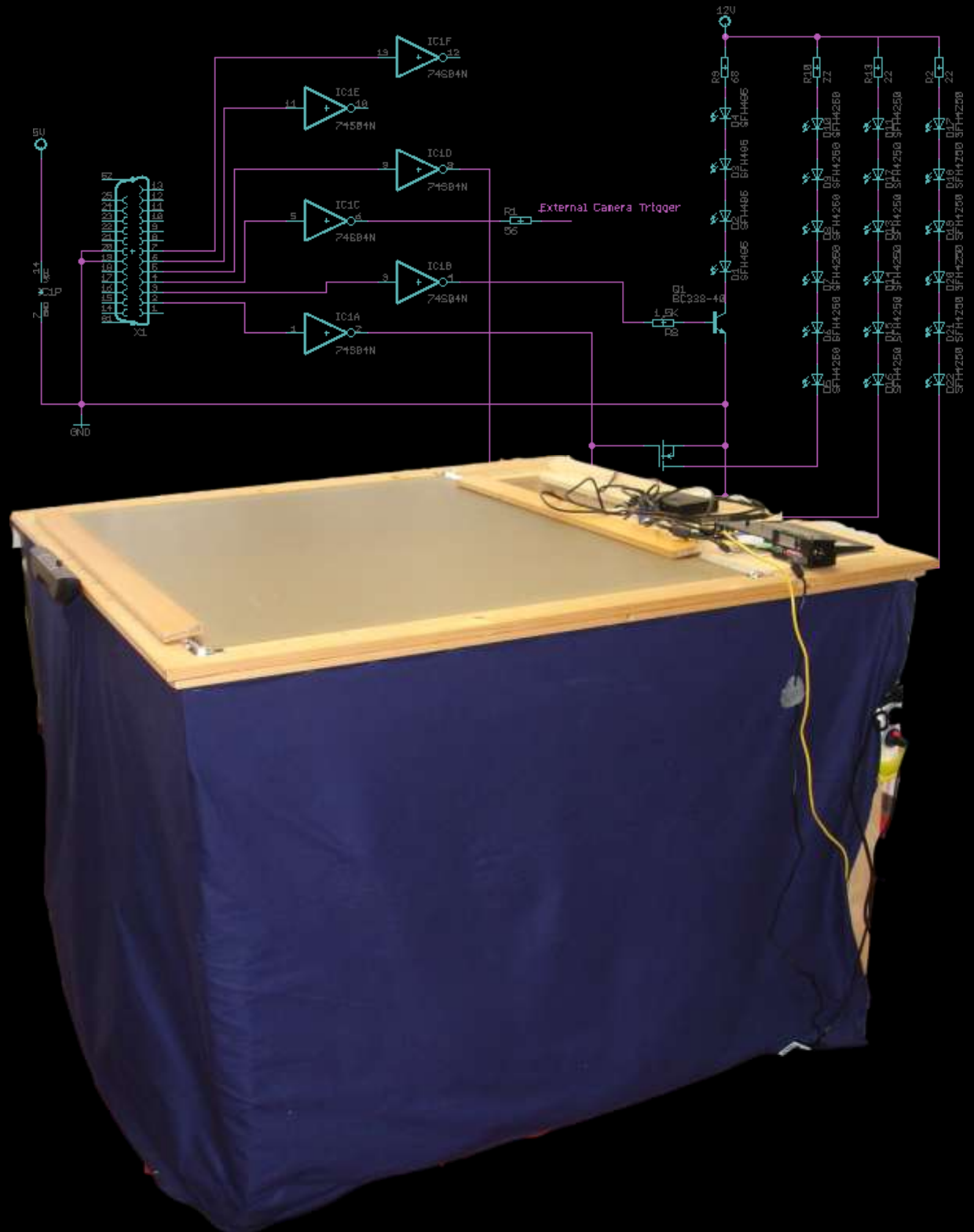
Client-Server architecture

Pulsed IR illumination

Alternating frames (FTIR ↔ Ref)

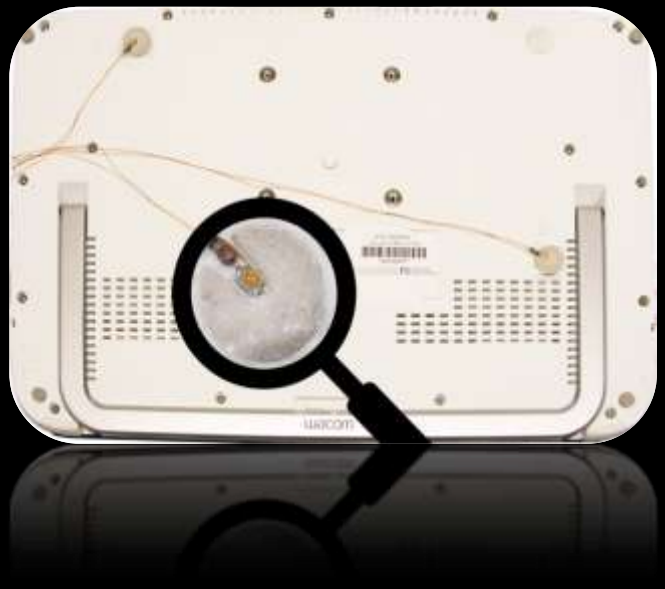


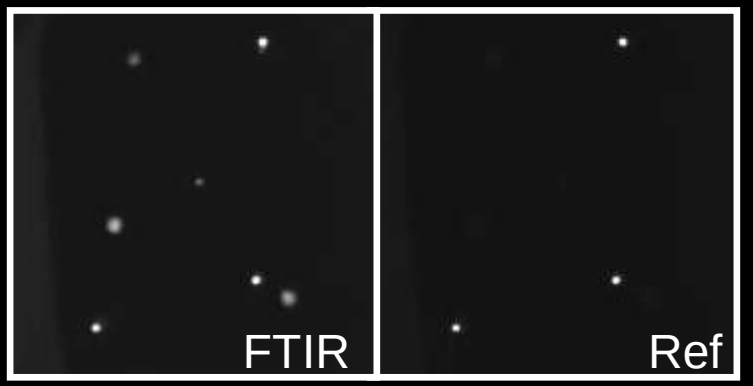




Point matching

Active markers are easy to identify in the reference image.





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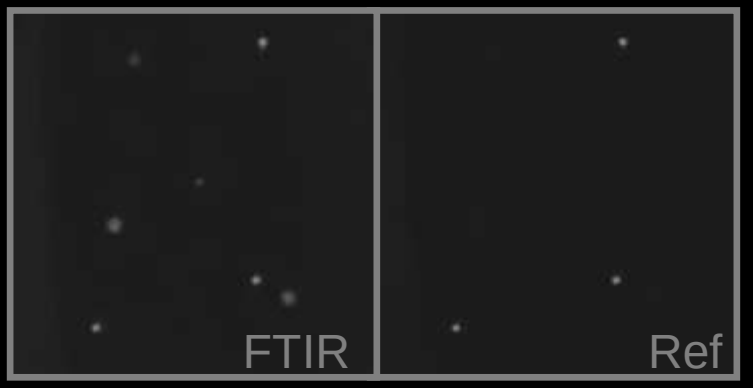
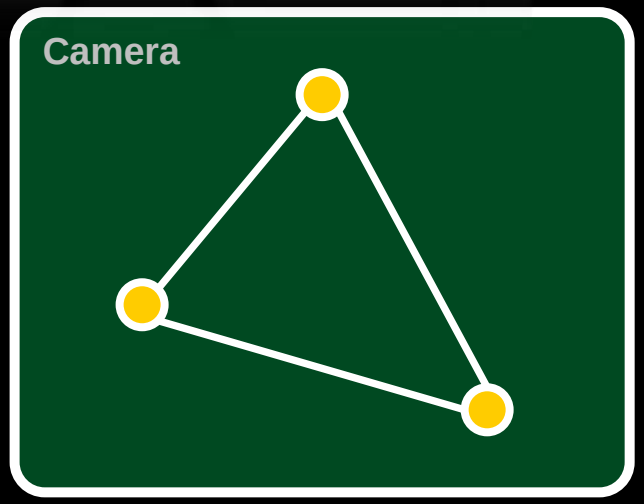
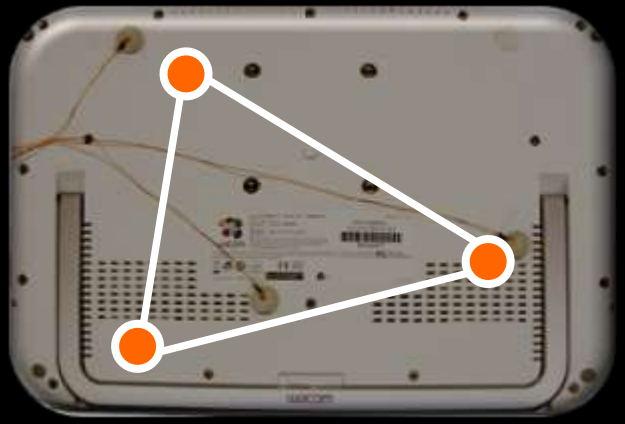


Matching of three points comes from the relative distances of the corners.

Three points define a rigid transformation.





Applications

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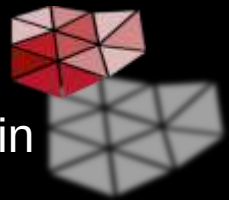
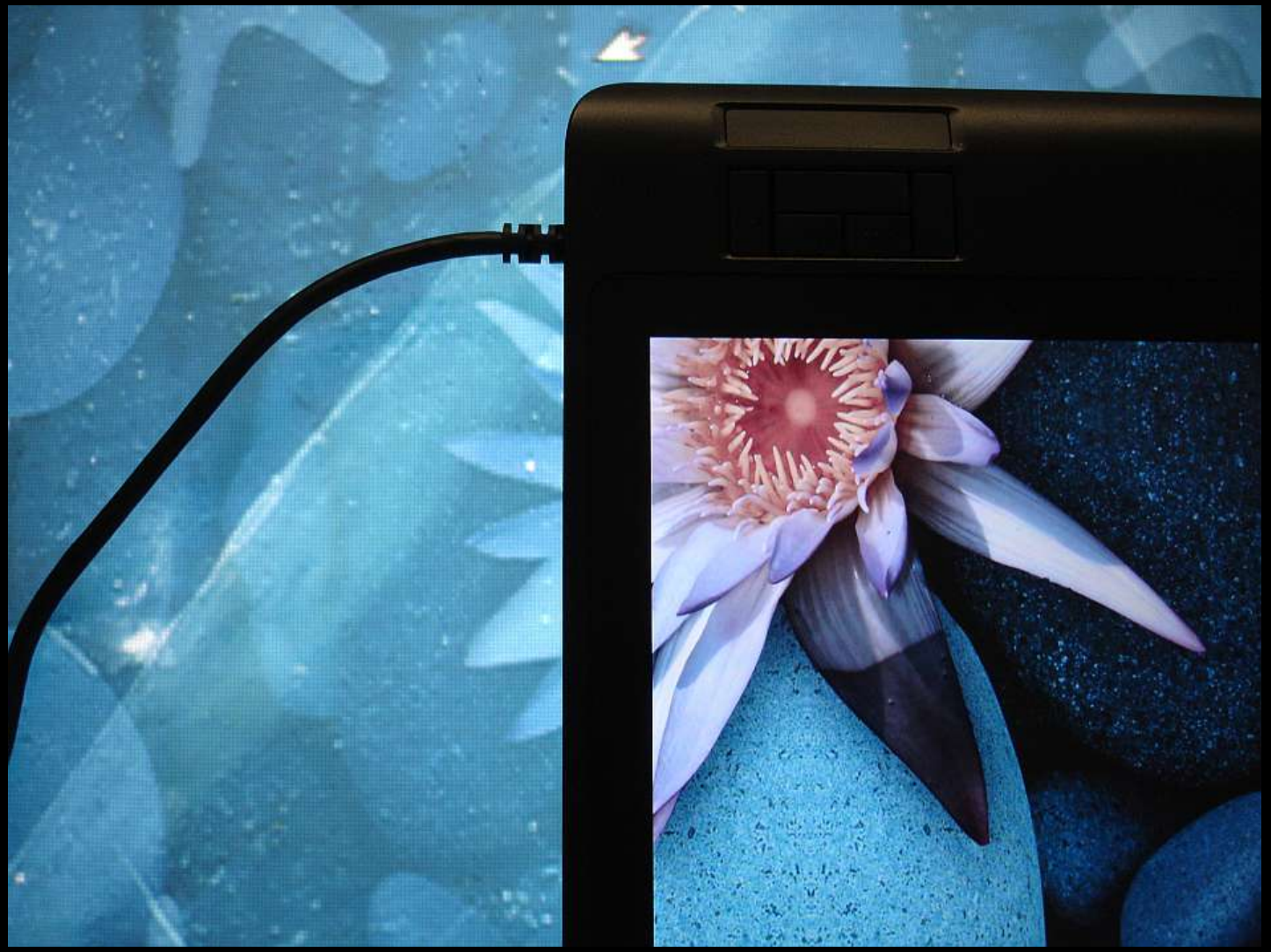


Applications

Proof of concept with fish-tank



Interactive map application

Using the Google Earth™ API

Sketch based modeling

Focus:

- Working on details
- Exact manipulations
- Movable

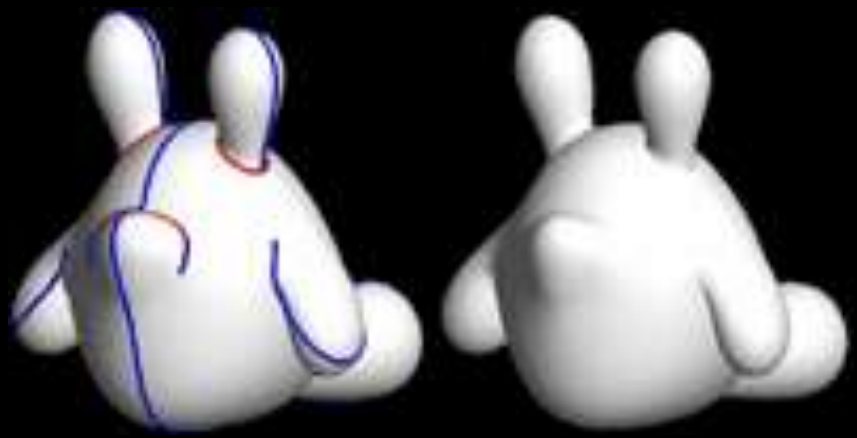
Context:

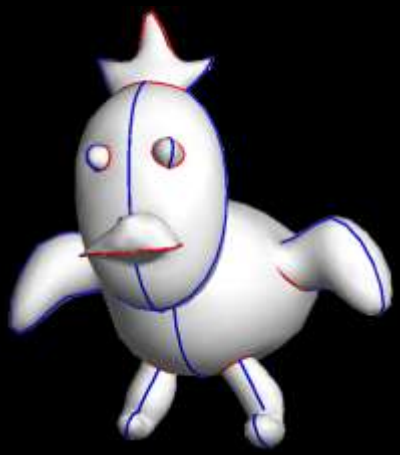
- Navigation
- Coarse sketching
- Overview

Sketch based modeling application

Based on FiberMesh [Nealen2007]

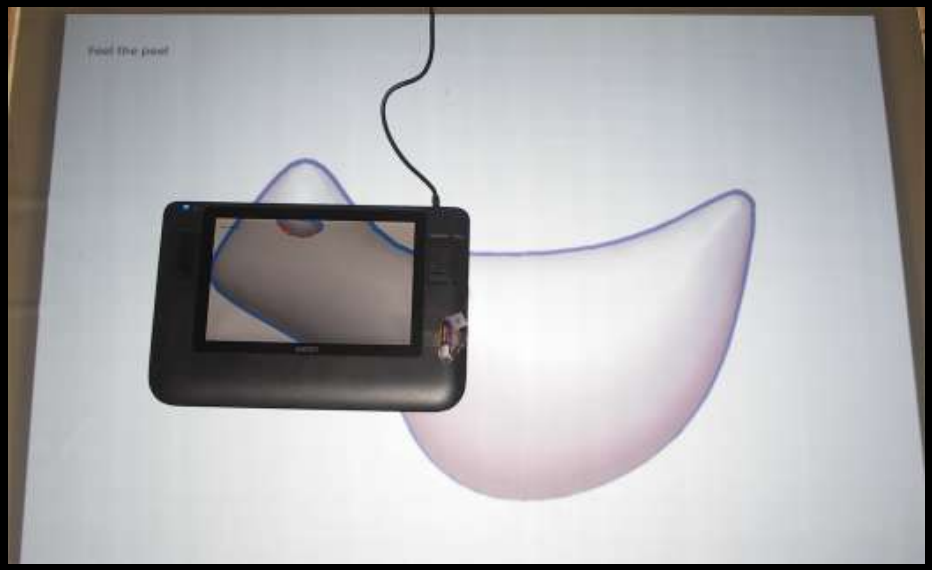
- 3D shape modelling from scratch
- Shape is defined by curves
- Manipulation with gestures



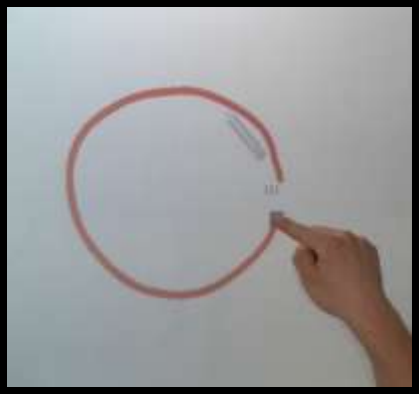


FiberMesh in Focus+Context

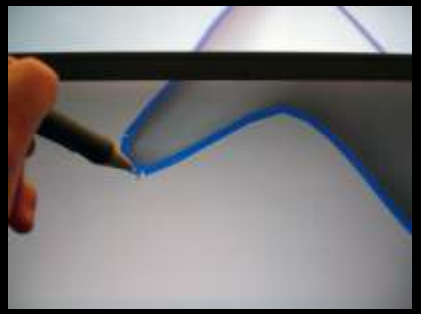
Sketching and navigating



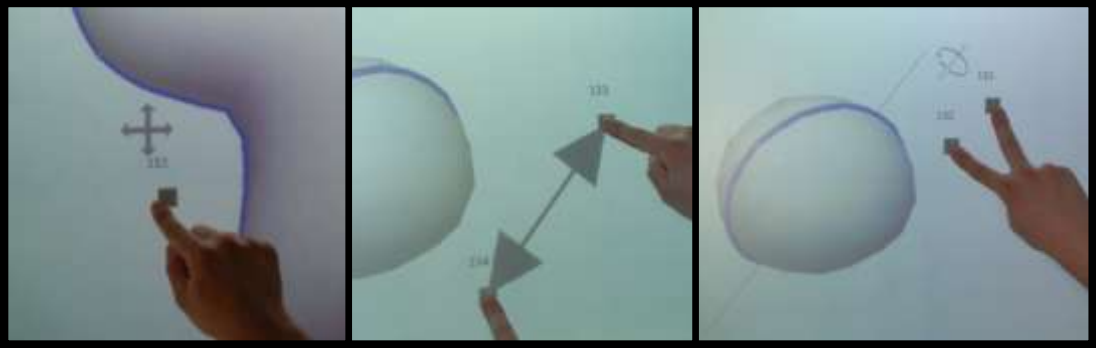
Overview



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?

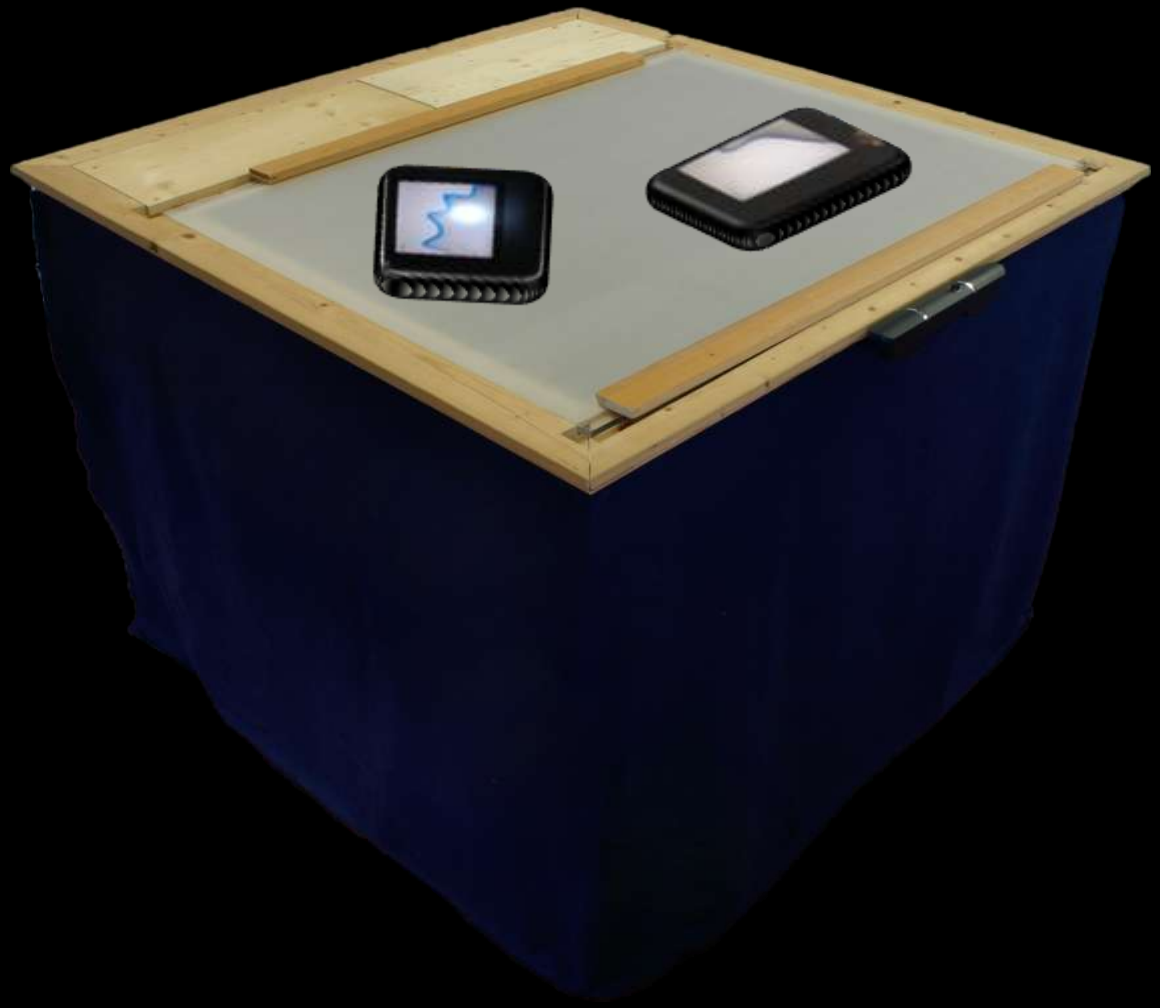
- What happens in a multi-user setup?

- Is it disturbing being blocked from touching in Focus?

Can the Focus+Context approach succeed in public?

- Assuming public multi-touch tables everwhere...

- Which personal devices make sense to be placed on such an interactive table?



Further research

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- Prefer they physical navigation or touch gestures?

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Can the Focus+Context approach succeed in public?

- Assuming public multi-touch tables everwhere...

- Which personal devices can support SBM when placed on an interactive table?

Thank you for listening.

Uwe Hahne, Jonas Schild, Stefan Elstner and Marc Alexa

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