Comparing free-hand Menu Techniques for Distant Displays

Linear-, Marking- and Finger-Counting Menu
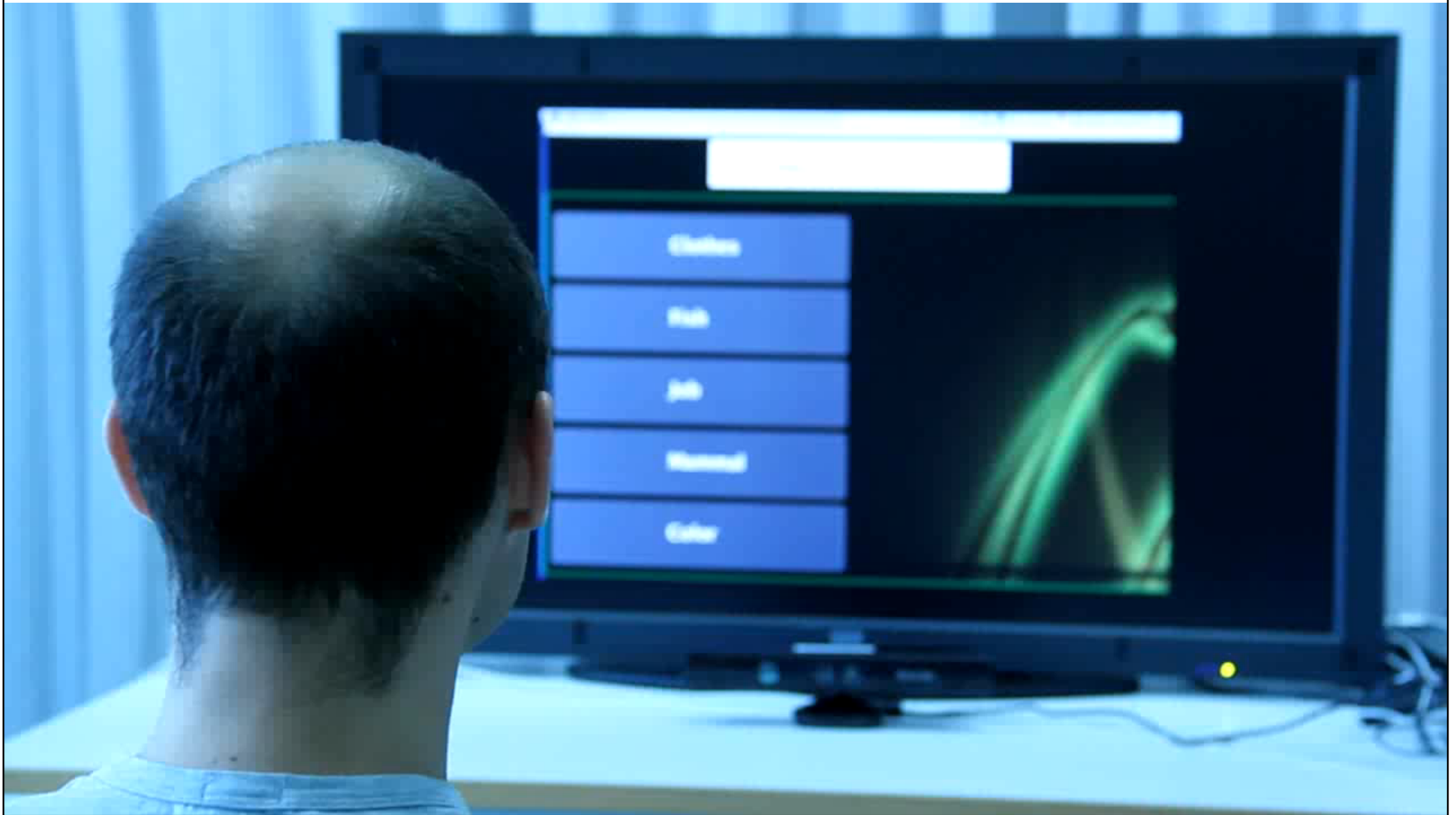
Gilles Bailly[1,2], **Robert Walter**[1], Jörg Müller[1], Tongyan Ning[1], Eric Lecolinet[2]

[1]Deutsche Telekom Laboratories, TU Berlin
[2]Telecom Paristech – CNRS LTCI

What is it about?

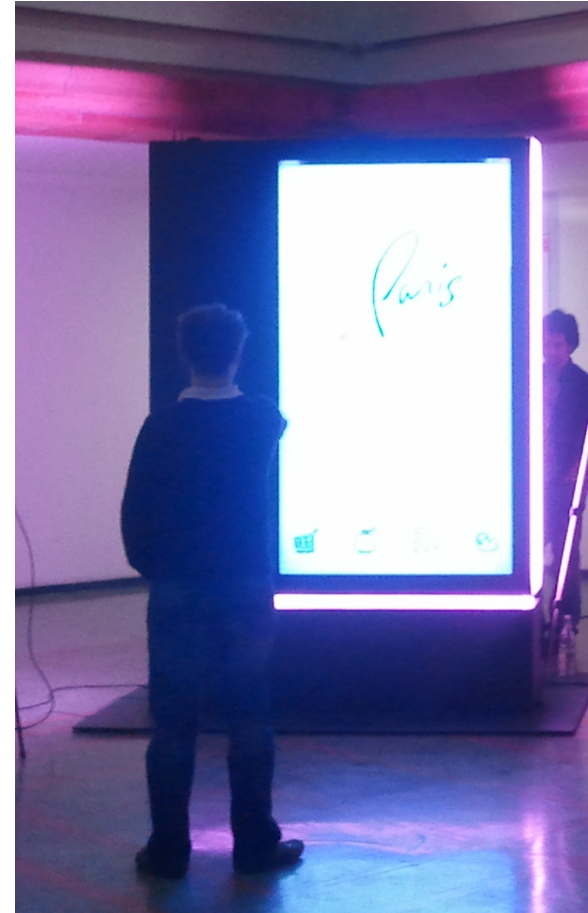# Where can it be applied?

Interactive
  Television

Interactive
  Public Displays

Why use it for Interactive TV?

Limitations of remote controls?

Why use it for Interactive TV?

Limitations of remote controls?

- **It's _always_ too far away**

Why use it for Interactive TV?

Limitations of remote controls?

- It's *always* too far away
- **Sometimes you don't want to touch it**

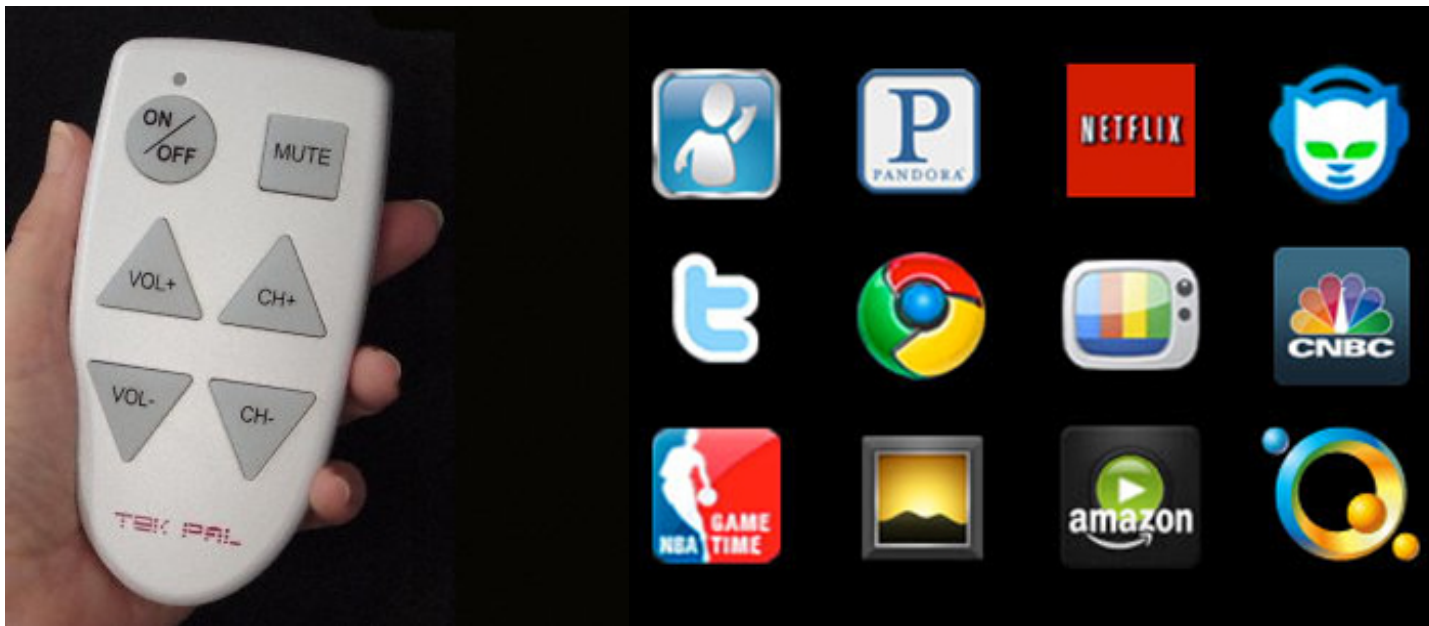# Why use it for Interactive TV?

Limitations of remote controls?

- It's *always* too far away

- Sometimes you don't want to touch it

- **Only one user at a time**

Why use it for Interactive TV?

Limitations of remote controls?

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- Only one user at a time
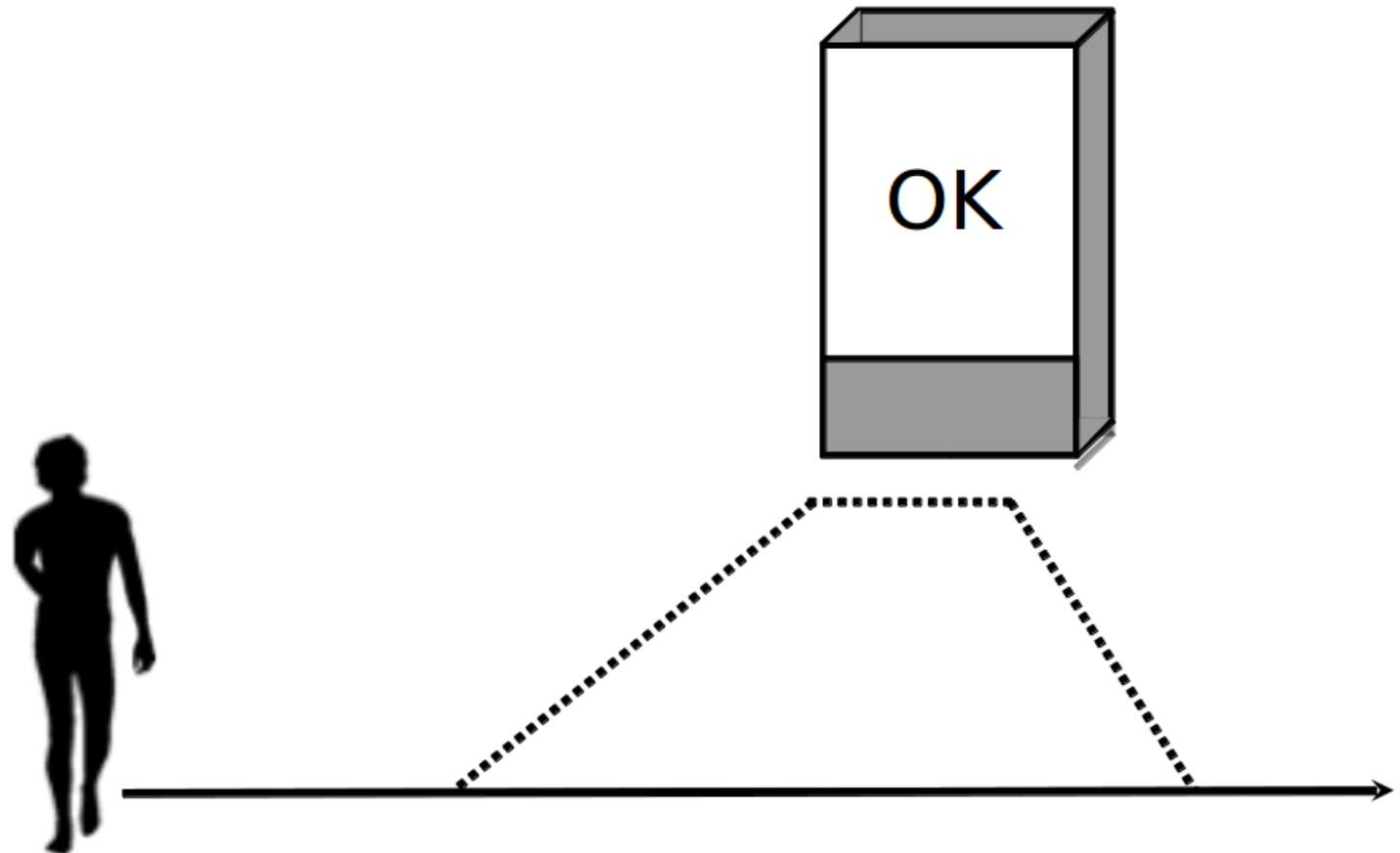
- **New ITV applications**

Why use it for Interactive Public Displays?

What's the problem with large touch screens?

Why use it for
Interactive Public Displays?

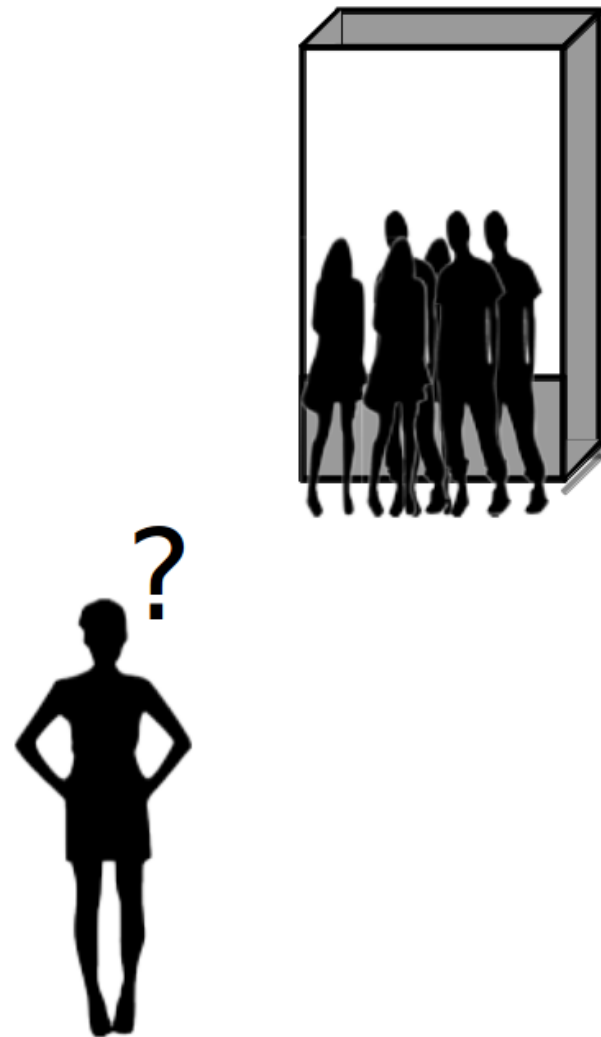What's the problem with large touch screens?

- Detour

Why use it for Interactive Public Displays?

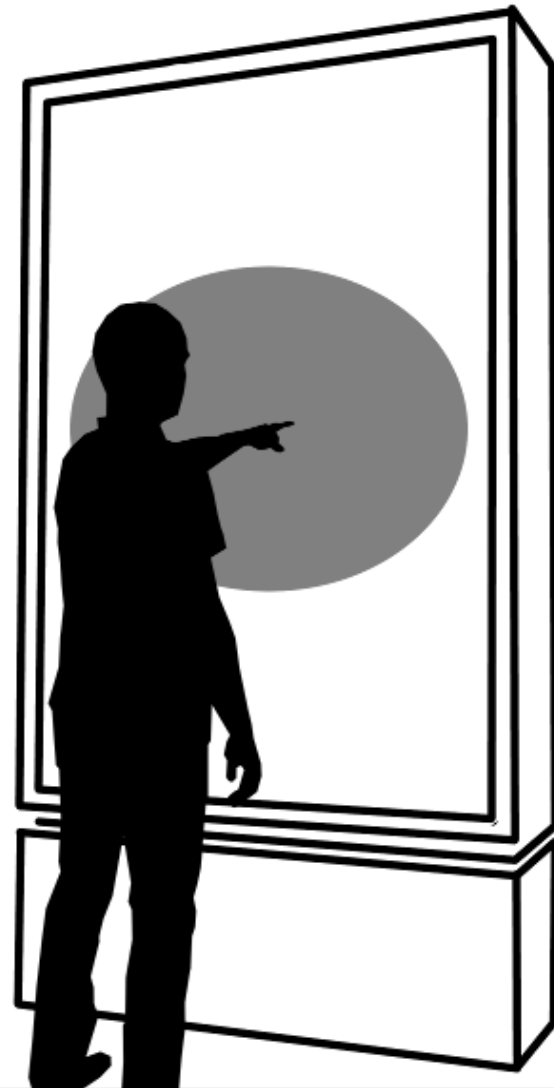What's the problem with large touch screens?

- Detour
- Occlusion

Why use it for Interactive Public Displays?

What's the problem with large touch screens?
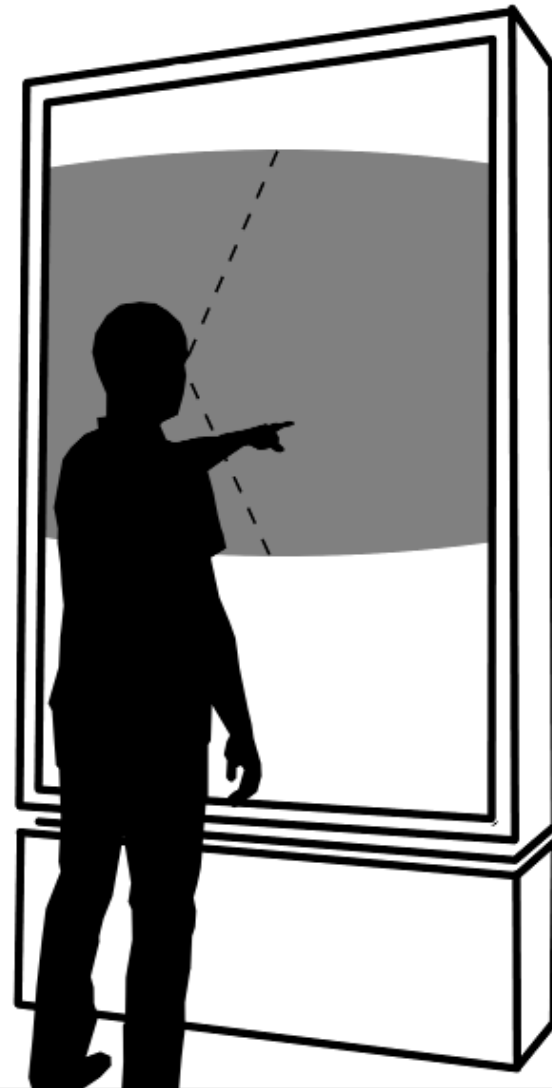
- Detour
- Occlusion
- Reachability

Why use it for Interactive Public Displays?
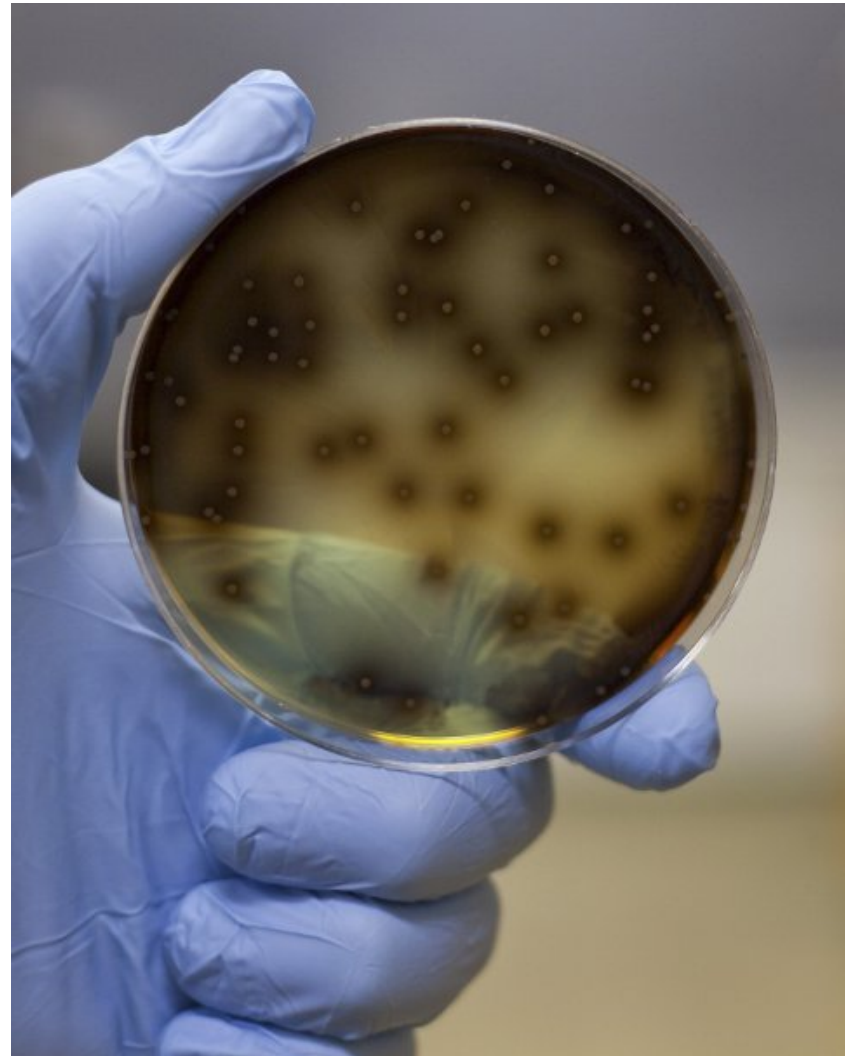
What's the problem with large touch screens?

- Detour
- Occlusion
- Reachability
- Visibility

Why use it for Interactive Public Displays?

What's the problem with large touch screens?

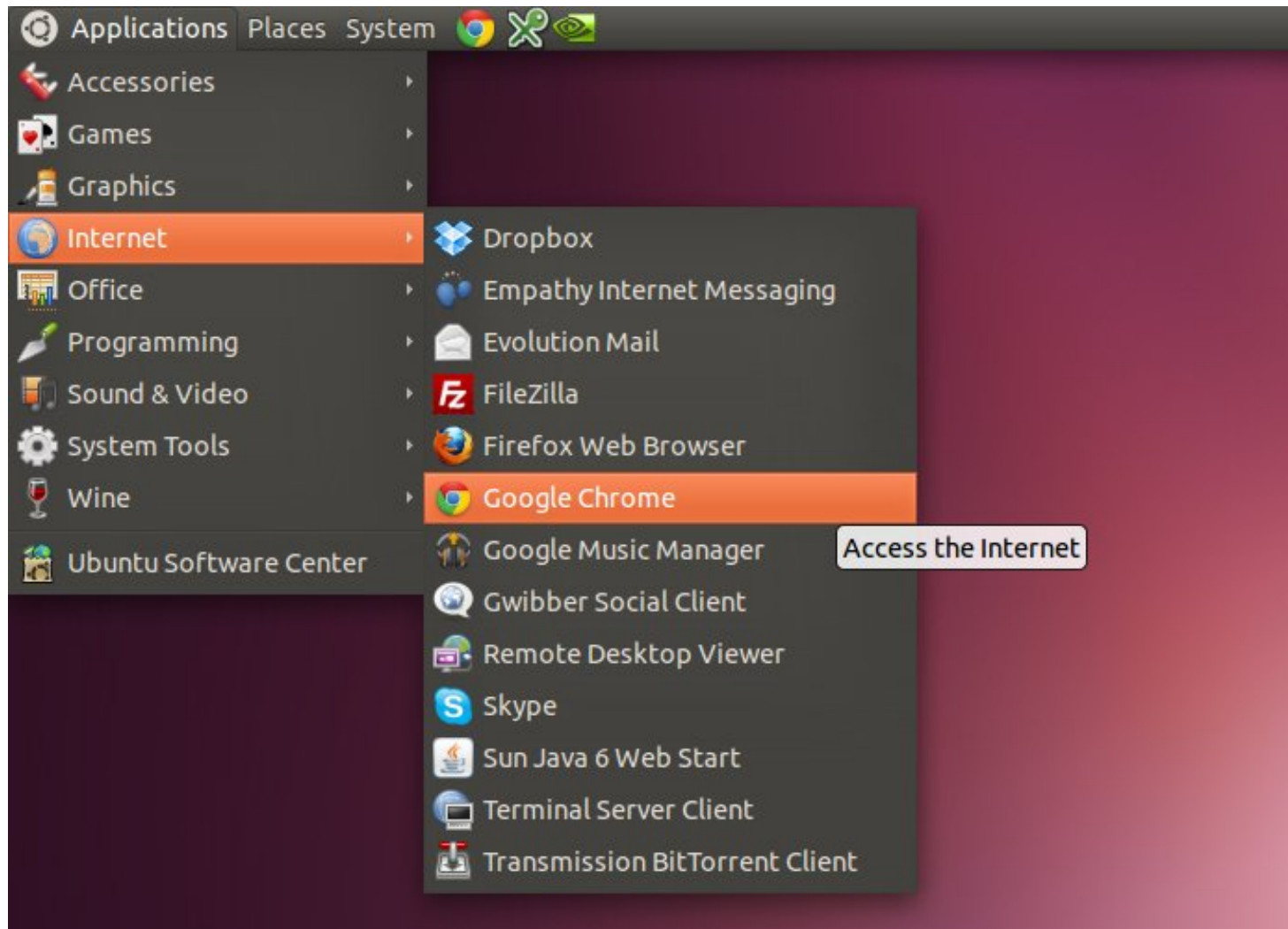- Detour
- Occlusion
- Reachability
- Visibility
- Hygiene

What's the Idea?

Free-hand menu selection on **distant** displays

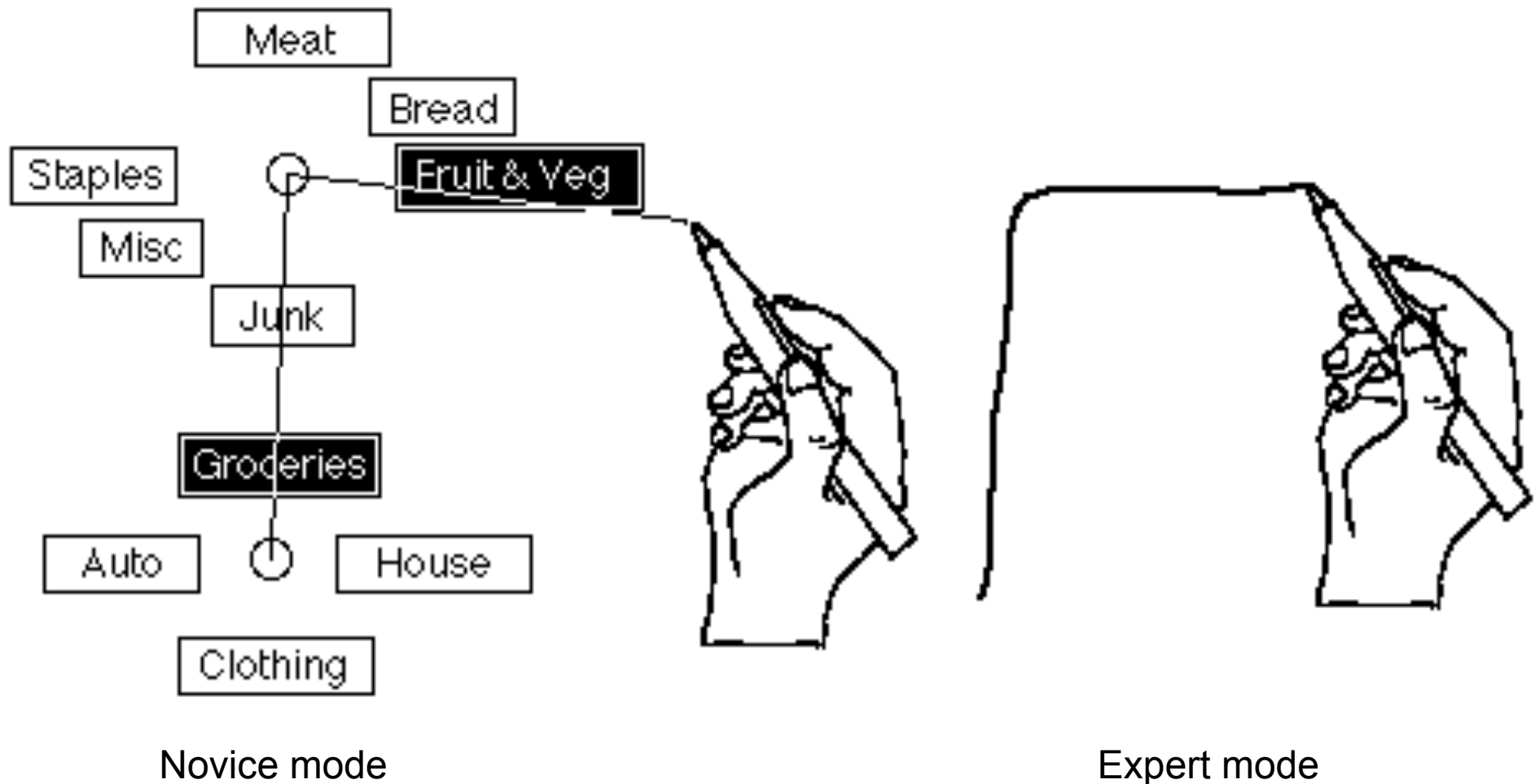- Free-hand: no Instrumentation, no touch
- Distant: more than one arm's length

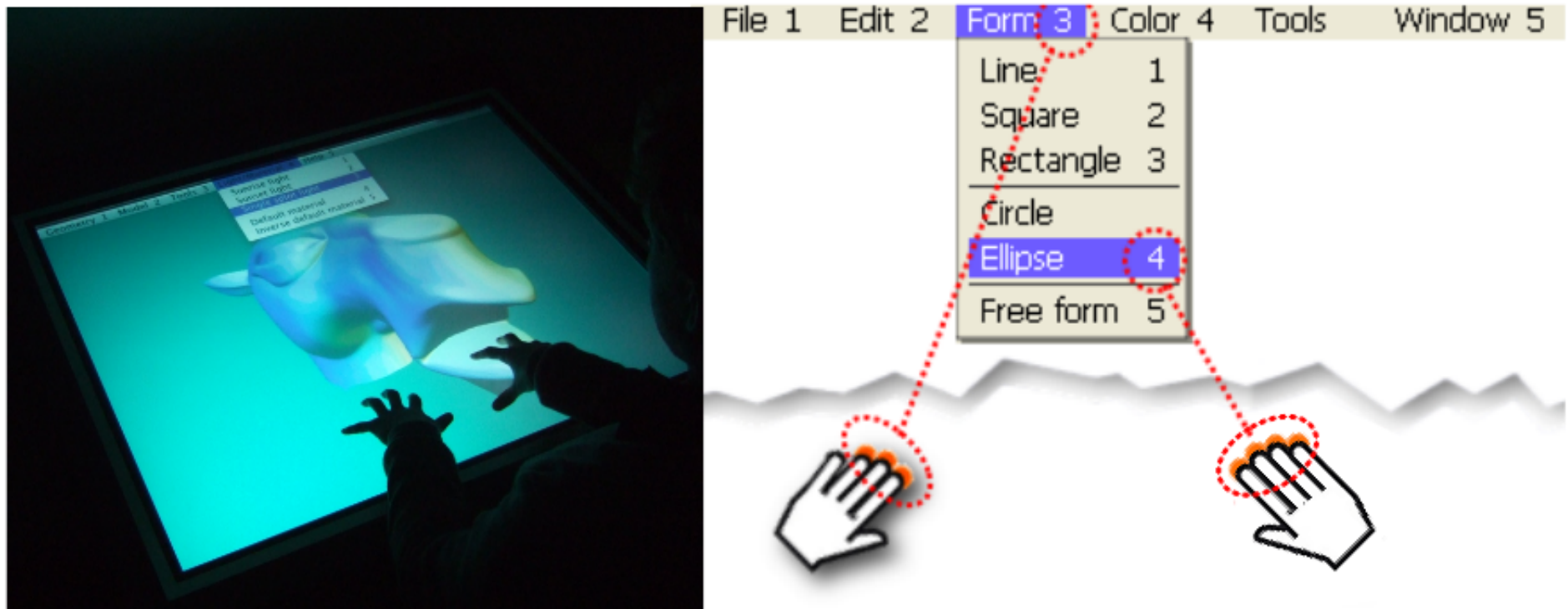Transfer existing menu techniques
 into the air

15

Linear Menu

Marking Menu

Novice mode   Expert mode
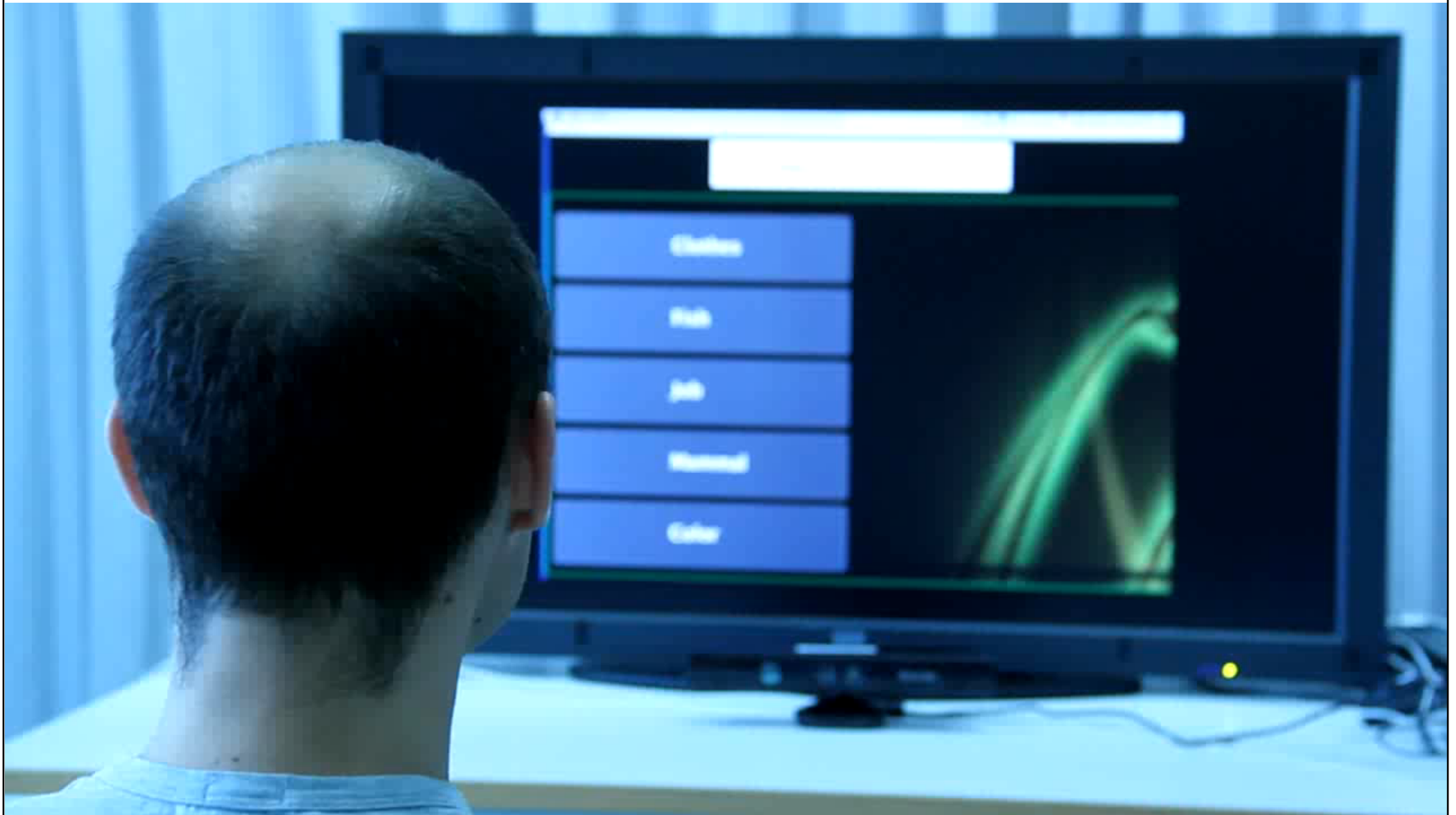
[Kurtenbach et al.]

Finger-Counting Menu

[Bailly et al.]

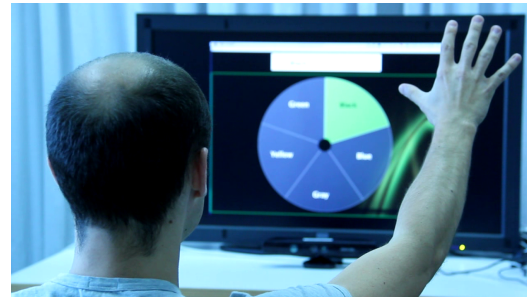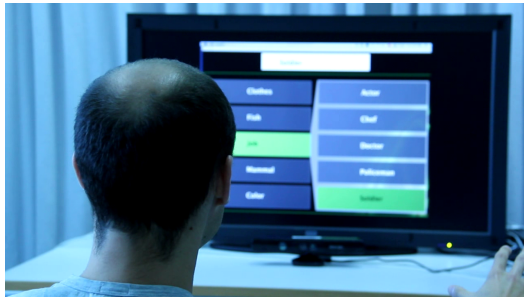# How to adapt these techniques to free-hand gestures?

Linear Menu
In the Air

Marking Menu
In the Air

Finger-Counting
In the Air

Free-hand Menu Techniques Summary

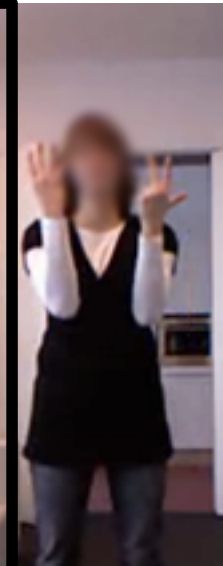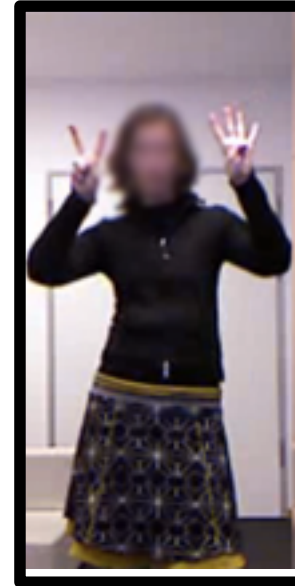|	Linear	Marking	Finger-Counting
Exploration	✔		✔
Eyes-free		✔	✔
Direct Selection			✔
Hierarchy Size	*	*	5^2

How would people express Finger-Counting Gestures?

TV

Public Display

Intuition
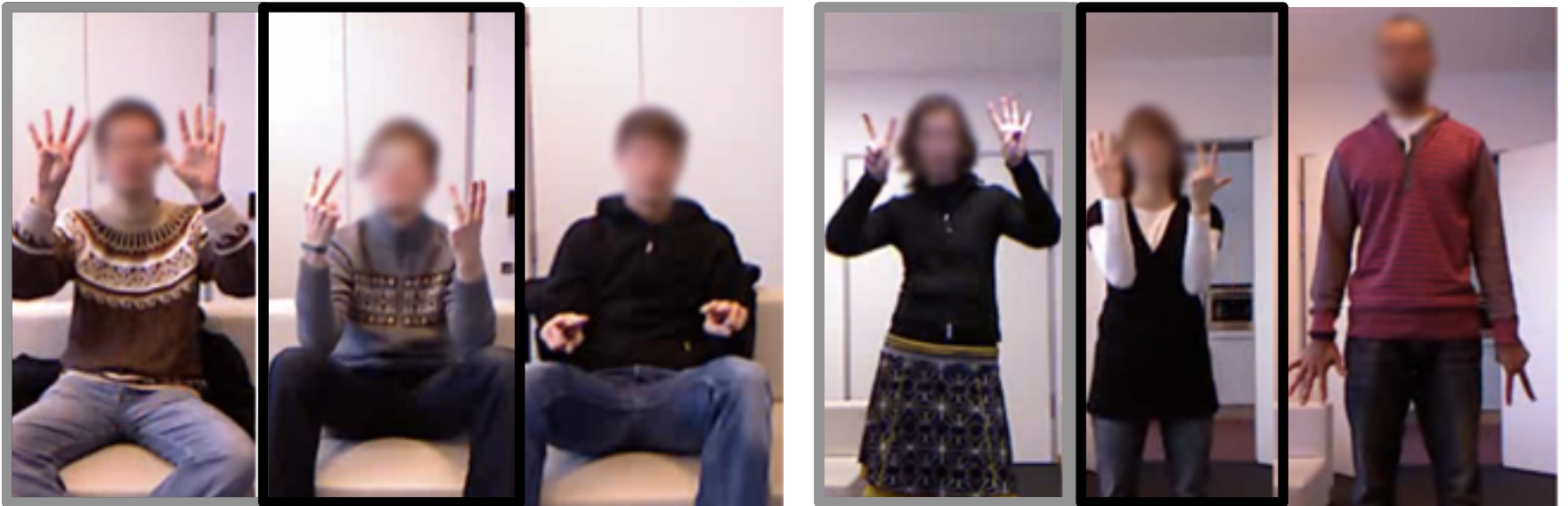
How would people express Finger-Counting Gestures?

TV

Public Display

Intuition

Preference

How does it work?
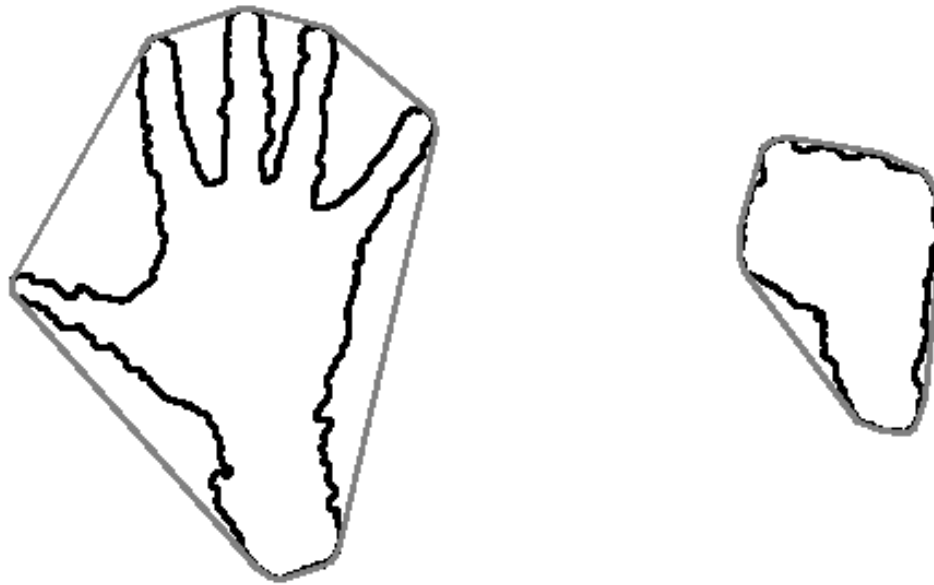# Implements

How does it work?
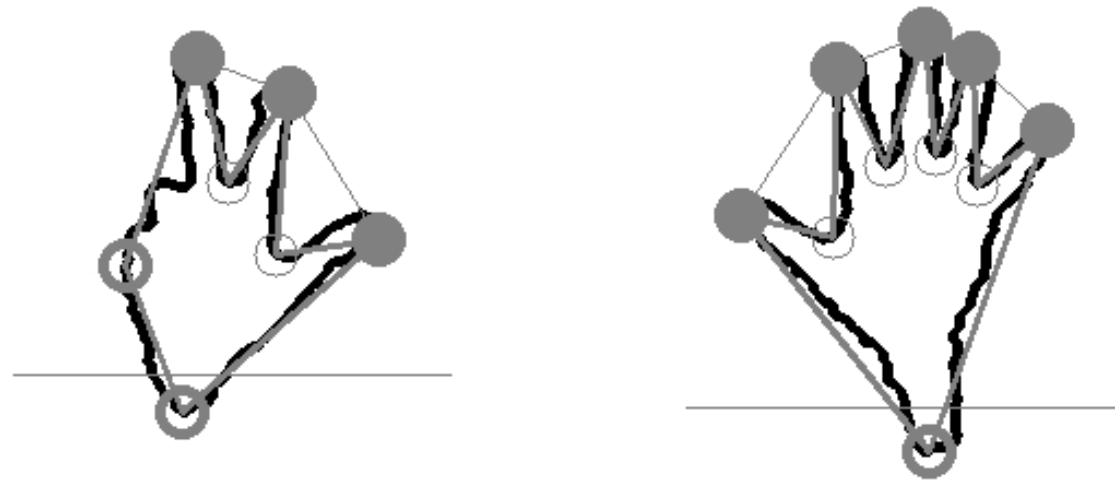# Detect Hands

How does it work?
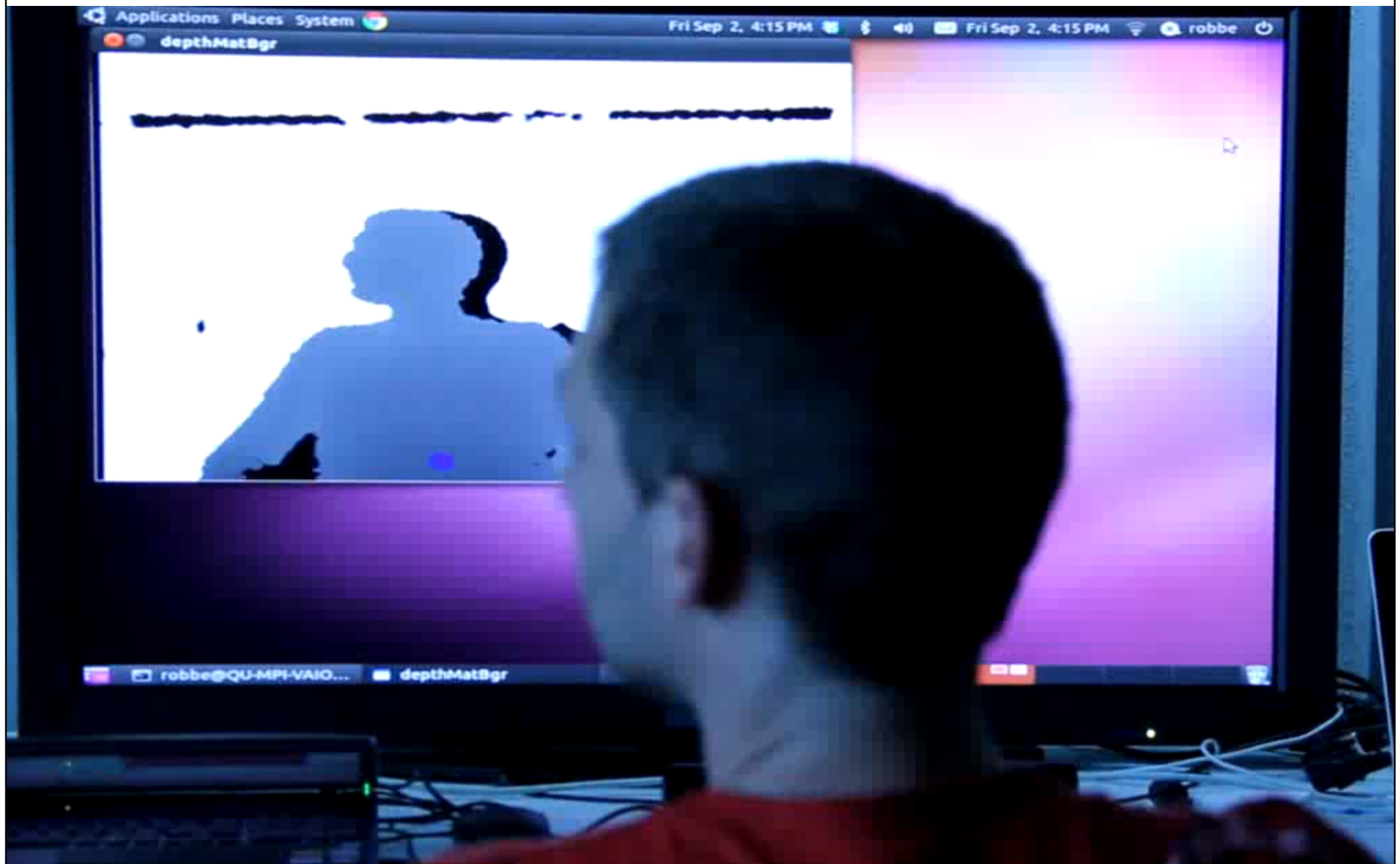# Detect Hands

How does it work?
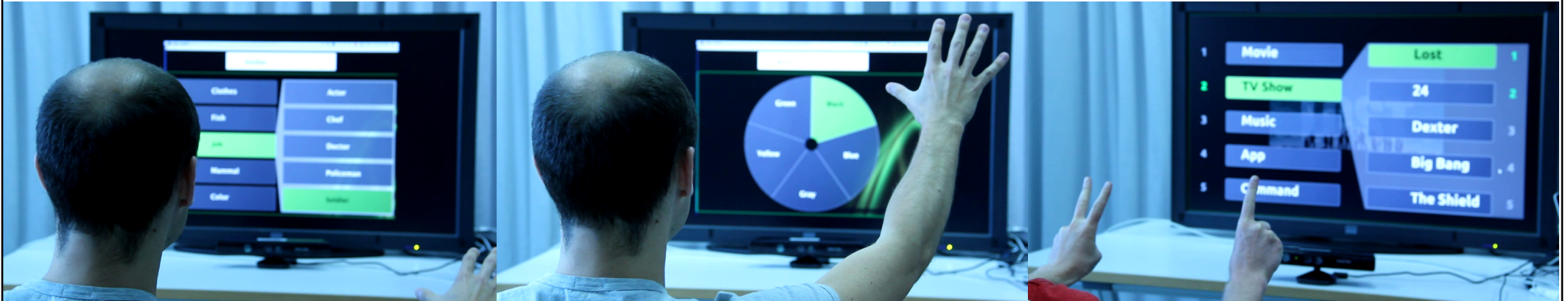# Detect Grasping

How does it work?
Count Fingers
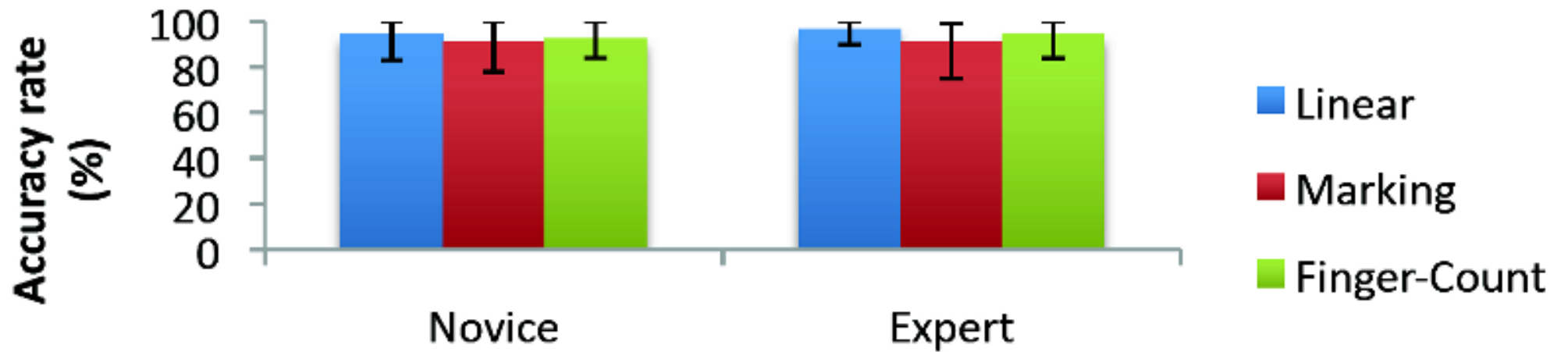
How does it work?

What about Usability?

User Study

- 14 participants (24-36)

* 3 menus
  * 2 behaviors
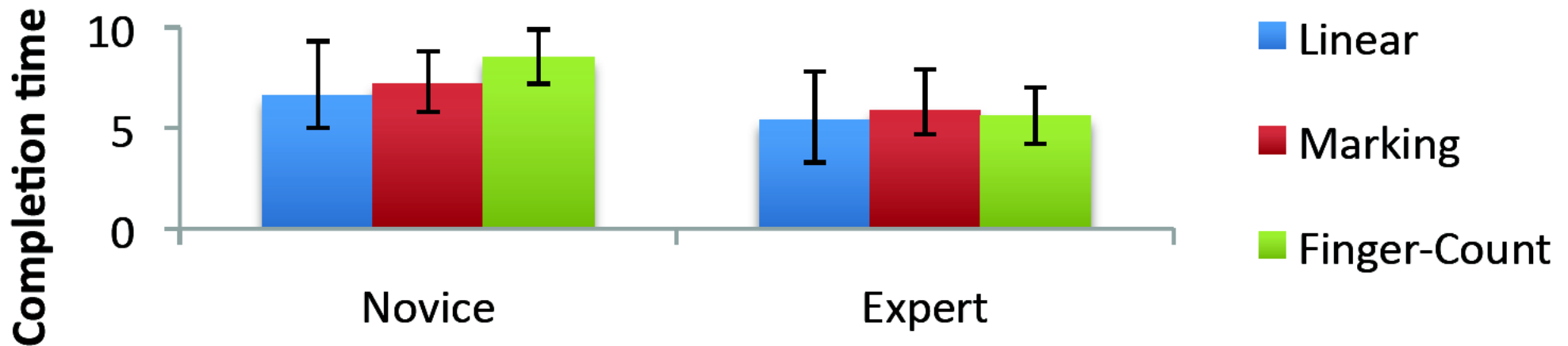 * 50 trials
  = **4200 selections**

Performance

Accuracy (> 94%)

Performance

Speed

- Novice: Linear > Marking > FC
- Expert: (Linear & FC) > Marking

Observations

- Finger-Counting
  - Problems of clear expression
  - Ambiguity, confusion (e.g. 3 fingers)
- Linear / Marking
  - Planar movements

Conclusion

- 3 novel interaction techniques for distant displays

- Analysis and recognition of finger-counting gestures

- User-study

  - Novice $\longrightarrow$ linear (Public Display)

  - Expert $\longrightarrow$ finger-counting (ITV)

Comparing free-hand
Menu Techniques for Distant Displays

Linear-, Marking- and Finger-Counting Menu

Gilles Bailly[1,2], **Robert Walter**[1], Jörg Müller[1], Tongyan Ning[1], Eric Lecolinet[2]

Thank You!

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[2]Telecom Paristech – CNRS LTCI

Why use it for Interactive TV?

Limitations of remote controls

- It's **never** there when you need it

- One remote control, multiple users

- Increasing functionality / complexity