LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

LFE Medieninformatik • Franz Berwein

Superimposed Displays

Medieninformatik Hauptseminar
Sommersemester 2009
„Interactive Surfaces“

Motivation

Outline

1. Connection
2. Tracking
3. Projection
4. Navigation
5. Other Forms of Interaction

1. Connection

User View:

- Bump devices together
- Enter a password
- Press the same key simultaneously
- Visual pattern
- Gesture recognition
- NFC/RFID tags
- „Stitching“: draw a line across the devices‘ displays

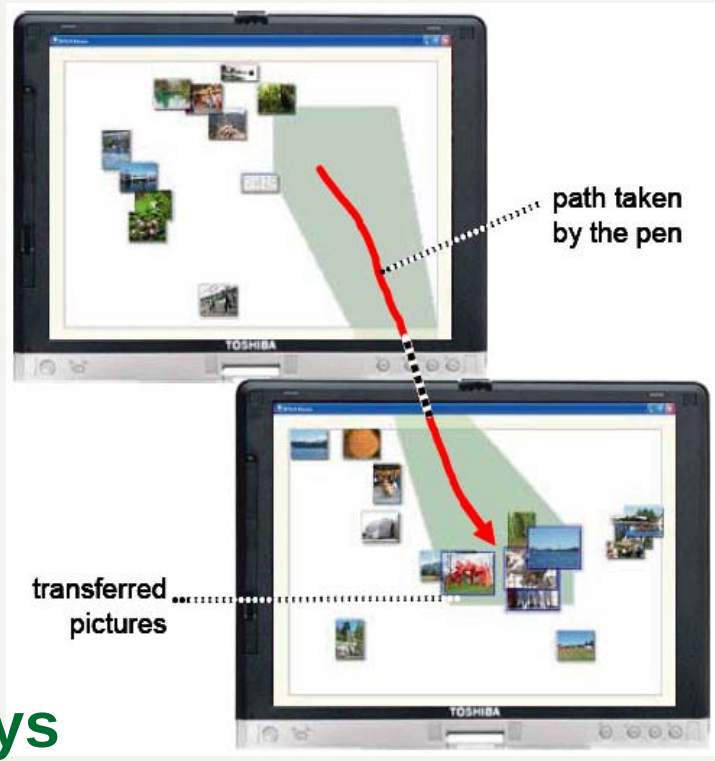


Figure: Stitching [12]

1. Connection

Technical View:

- **Bluetooth**
- **Infrared port**
- **WLAN**
- **Other wireless technologies**
- **Combinations for disambiguation**

top: http://de.wikipedia.org/wiki/Bluetooth, bottom: http://www.irda.org/

2. Tracking

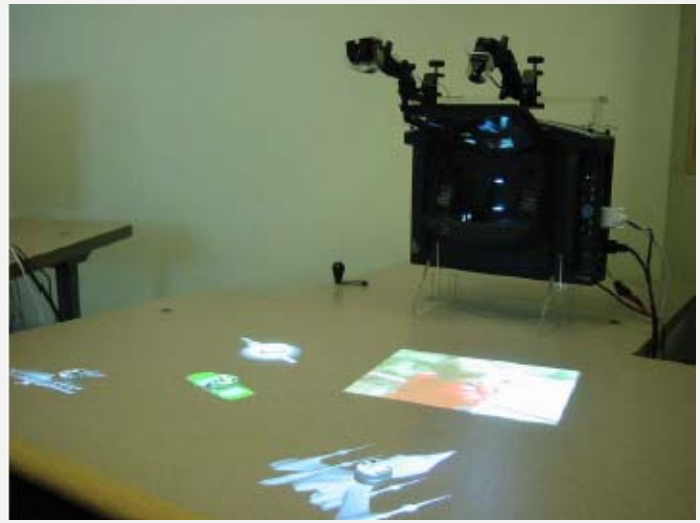
- (Matrix of) NFC/RFID tags
- Infrared (passive / active)
- Light emission (handheld screen or flashlight)
- Ultrasonic tracking
- Camera tracking
- Inertial tracking

top: LightSense [1], bottom: Smart Phone [2]

3. Projection

Front projection:

- **Occlusion**
- **Setup and maintenance is usually tedious**
- **Seamless integration**
- **Shadow as depth cue**
- **AR applications (HUD)**



top: Ubiquitous Graphics [3], bottom: PlayAnywhere [4]

3. Projection

Rear projection:

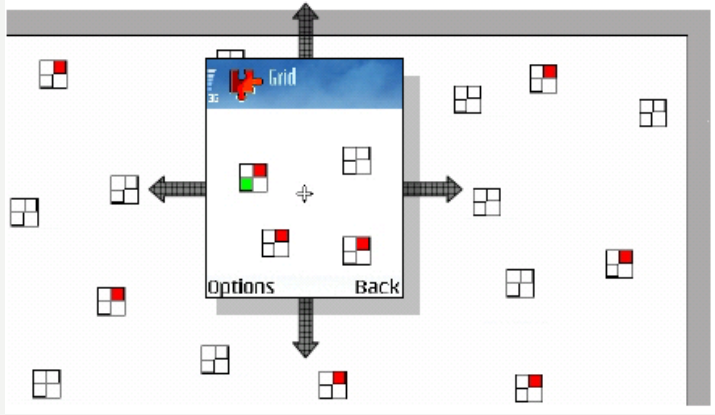
- **Self-contained system**
- **Requires more space**
- **More expensive**
- **Switchable diffuser → two images at once**

top: LightSense [1], bottom: SecondLight [5]
next page: Map Navigation with Mobile Devices [6]

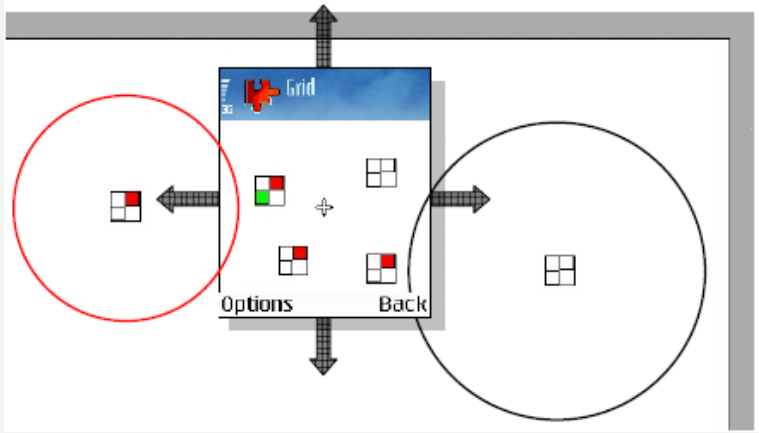
4. Navigation

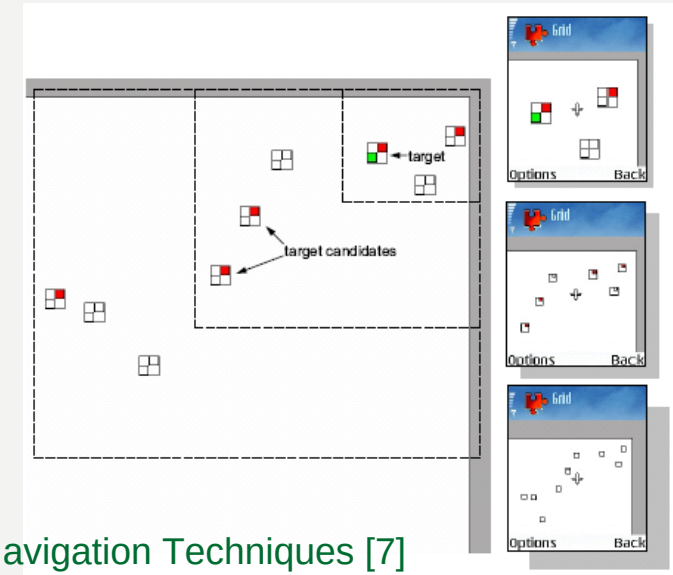
Problem 1: Small screen estate
Usual solution: Scrolling („static peephole“)
→ defies spatial memory
Better: „dynamic peephole“

4. Navigation



Problem 2: Locating objects
Usual solution: Panning
→ slow
Better: Zooming and halo





Figures: Navigation Techniques [7]

4. Navigation

2D Movement:

- Move cursor with trackpad or joystick
- Tilt (accelerometer)
- Camera tracking
- Optical Flow Analysis

3D Movement:

- Position and orientation
- Gesture tracking

Figure: Smart Phone [2]

5. Other Forms of Interaction

- Orientation
- Selection
- Drag-and-Drop
- Pathing
- Quantifying
- Text Input

Figure: Boom Chameleon [13]

5. Other Forms – Selection

- RFID, NFC, visual tags
- Camera image of desired object
- Pointing device
- Speech / gesture recognition
- Typing name of desired object
- Programmed function keyboard

5. Other Forms – Drag-and-Drop

- Finger metaphor on tabletops
- „Hold“ object and move handheld
- Store object in a GUI element
- Two planes: drawing and clipboard

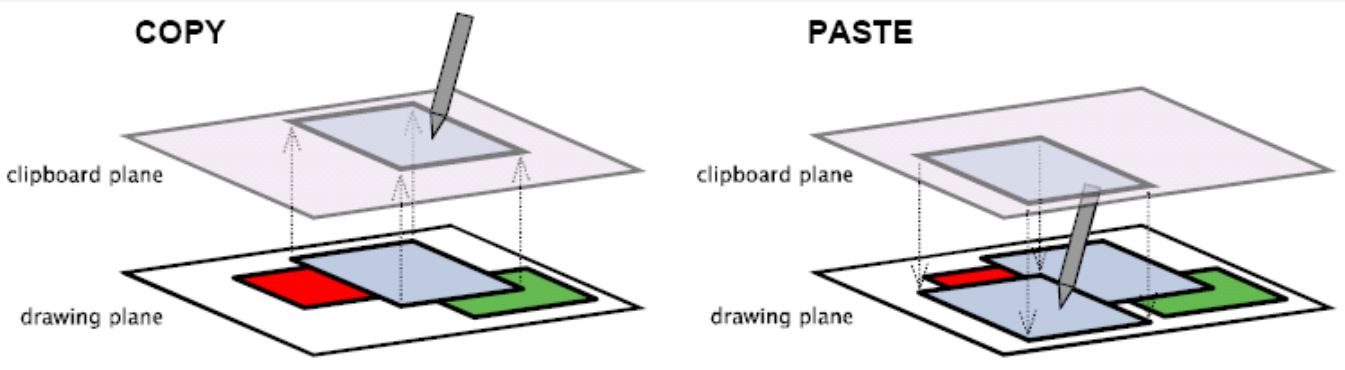


Figure: Peephole Displays [8]. Previous page: Smart Phone [2]

5. Other Forms – Drag-and-Drop

Options:

- **Pick-and-Drop (+)**
- **Press-and-Flick**
- **Corresponding Gestures**
- **Slingshot**
- **Pantograph**
- **Radar View (++)**

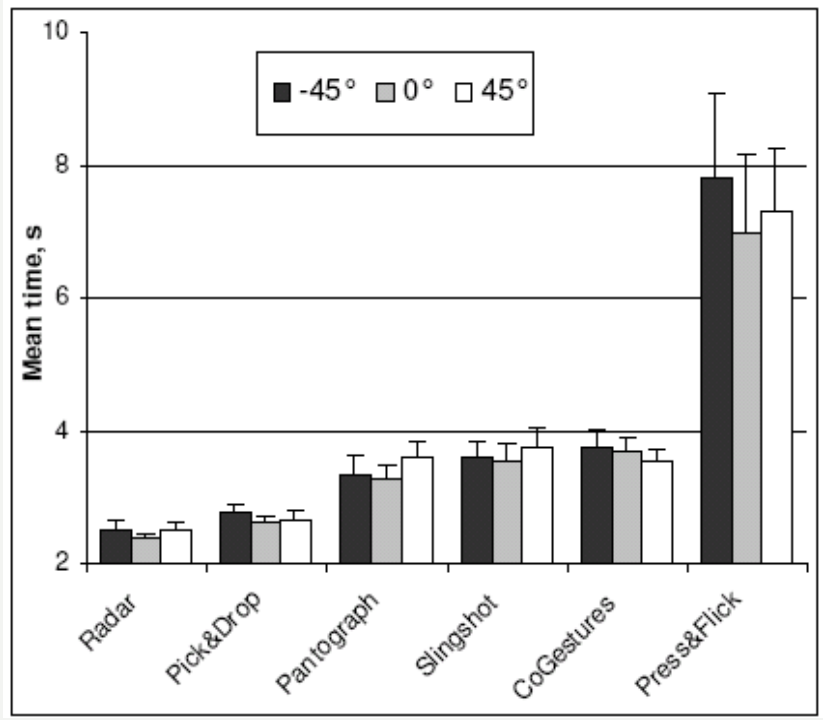
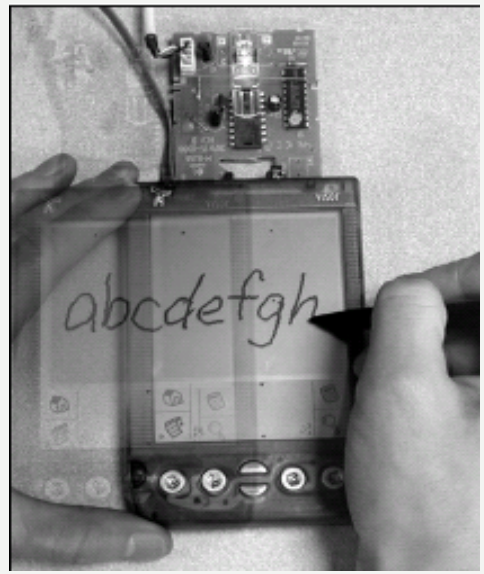


Figure: Multi-Display Reaching [9]

5. Other Forms – Text Input

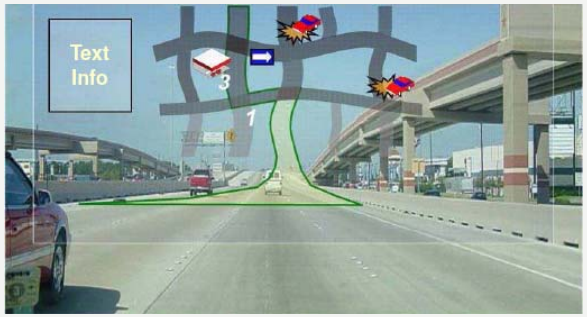
- Usually key mapping with multi-press or dictionary (T9)
- Enhancement through concurrent chording: tilt or press multiple keys at once
- Writing on handheld screen: small size → huge benefit from dynamic peephole

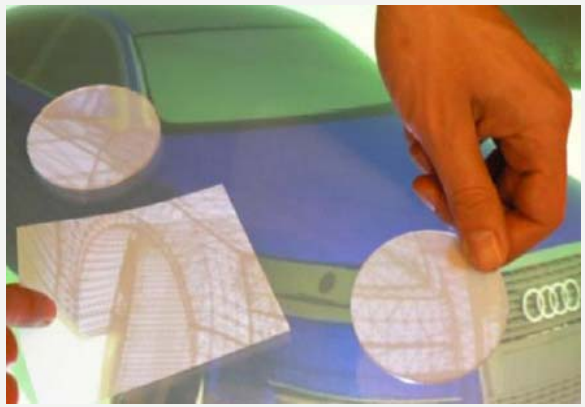


top: Chording and Tilting [10], bottom: Peephole Displays [8]

Thanks for your attention!

Questions?





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