

Maya Cakmak, Matt Kay, Brad Jacobson, King Xia

PAPER PROTOTYPING

human-computer interaction
CSE 440 WINTER 2015



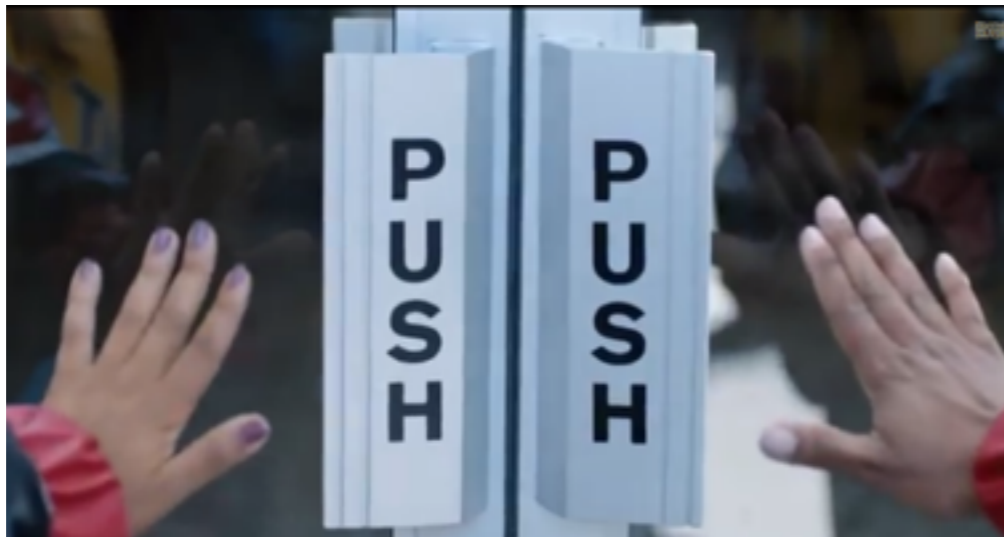
University of
Washington

FEB 03 - WEEK 5 - TUESDAY

Phew...

<p>Jan 26</p> <p>WEEK 4</p> <p>Maya Office Hour 1:30 - 2:30 CSE 542</p>	<p>Jan 27</p> <p>Design principles 10:30 - 11:50 EEB 045</p> <p>2e - Task Review</p>	<p>Jan 28</p>	<p>Jan 29</p> <p>Human Performance 10:30 - 11:50 EEB 045</p>	<p>Jan 30</p> <p>Sections 10:30 - 11:20 MGH 287 1:30 - 2:20 MGH 254</p> <p>2f - Design Check-in</p>
<p>Feb 2</p> <p>Reading1: Research Paper</p> <p>Maya Office Hour 1:30 - 2:30 CSE 542</p>	<p>Feb 3</p> <p>Paper prototyping 10:30 - 11:50 EEB 045</p> <p>2g - Getting the Right Design Report</p>	<p>Feb 4</p>	<p>Feb 5</p> <p>Presentations 10:30 - 11:50 EEB 045</p>	<p>Feb 6</p> <p>Presentations 10:30 - 11:20 MGH 287 1:30 - 2:20 MGH 254</p>

HCI @ Superbowl



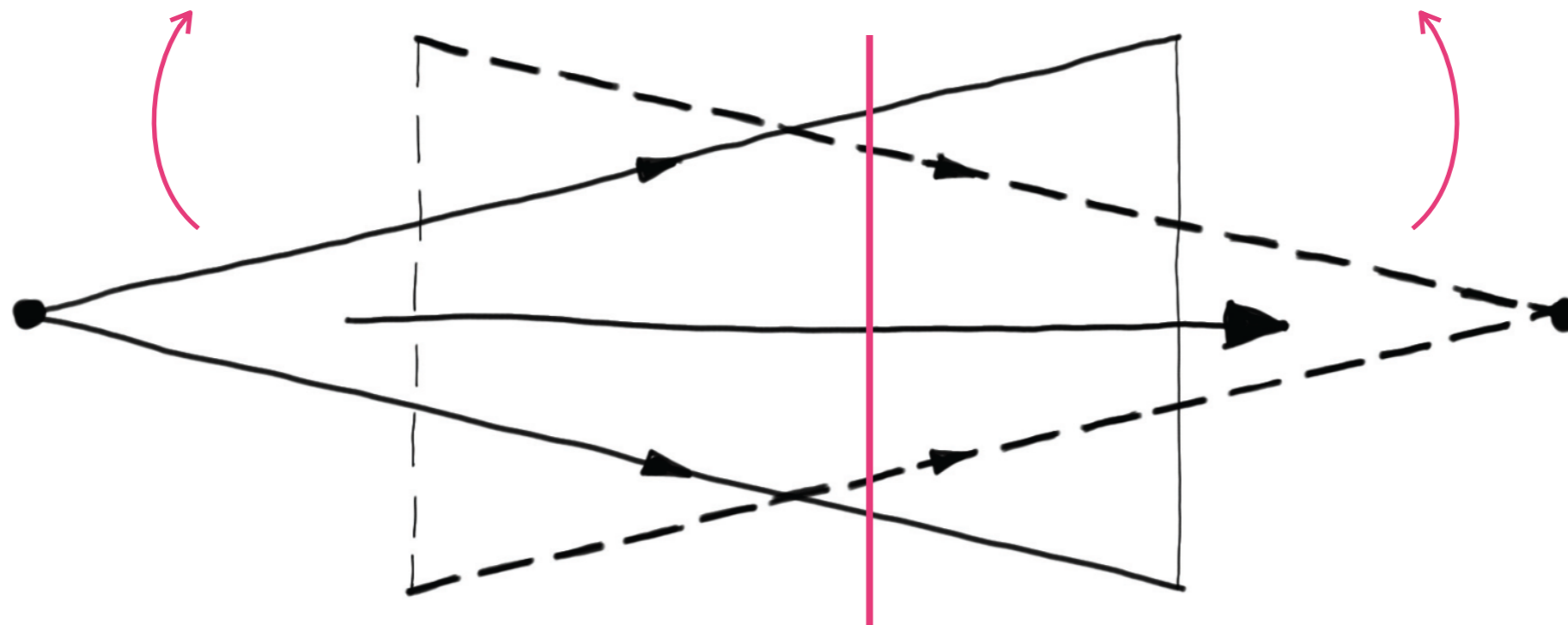
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getting the right design

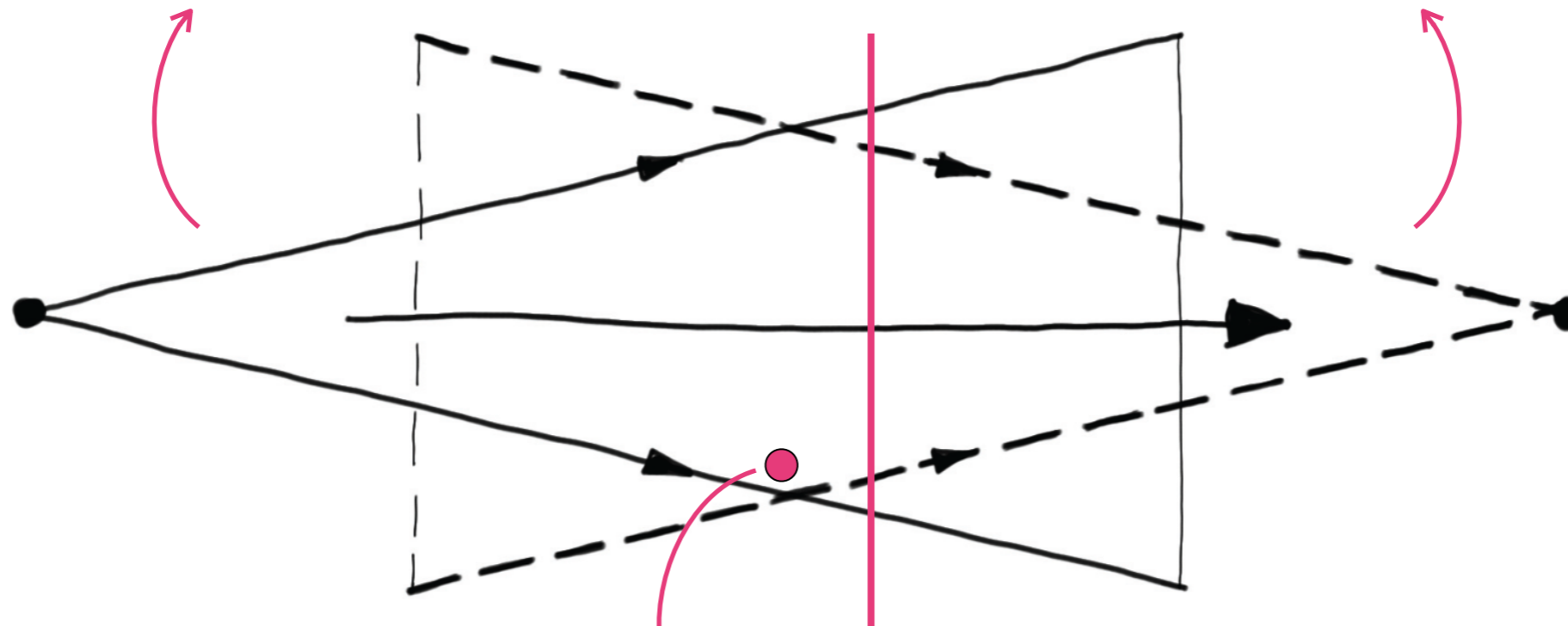
getting the design right



Phew...

getting the right design

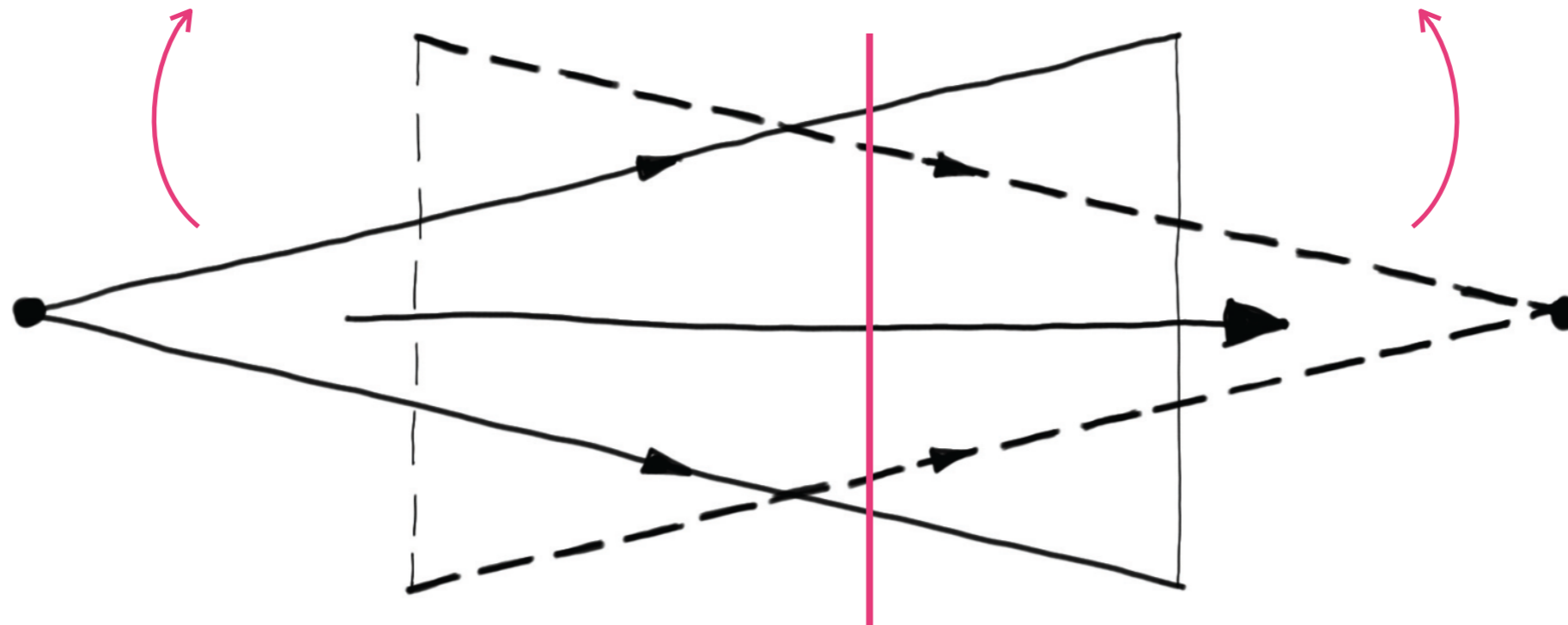
getting the design right



Phew...

getting the right design

getting the design right



Today

- Recap human abilities [20min]
 - Cover Fitt's Law
- Paper prototyping [55min]
 - Description and guidelines [25min]
 - Exercise [30min]

HUMAN ABILITIES

...and their implications for design



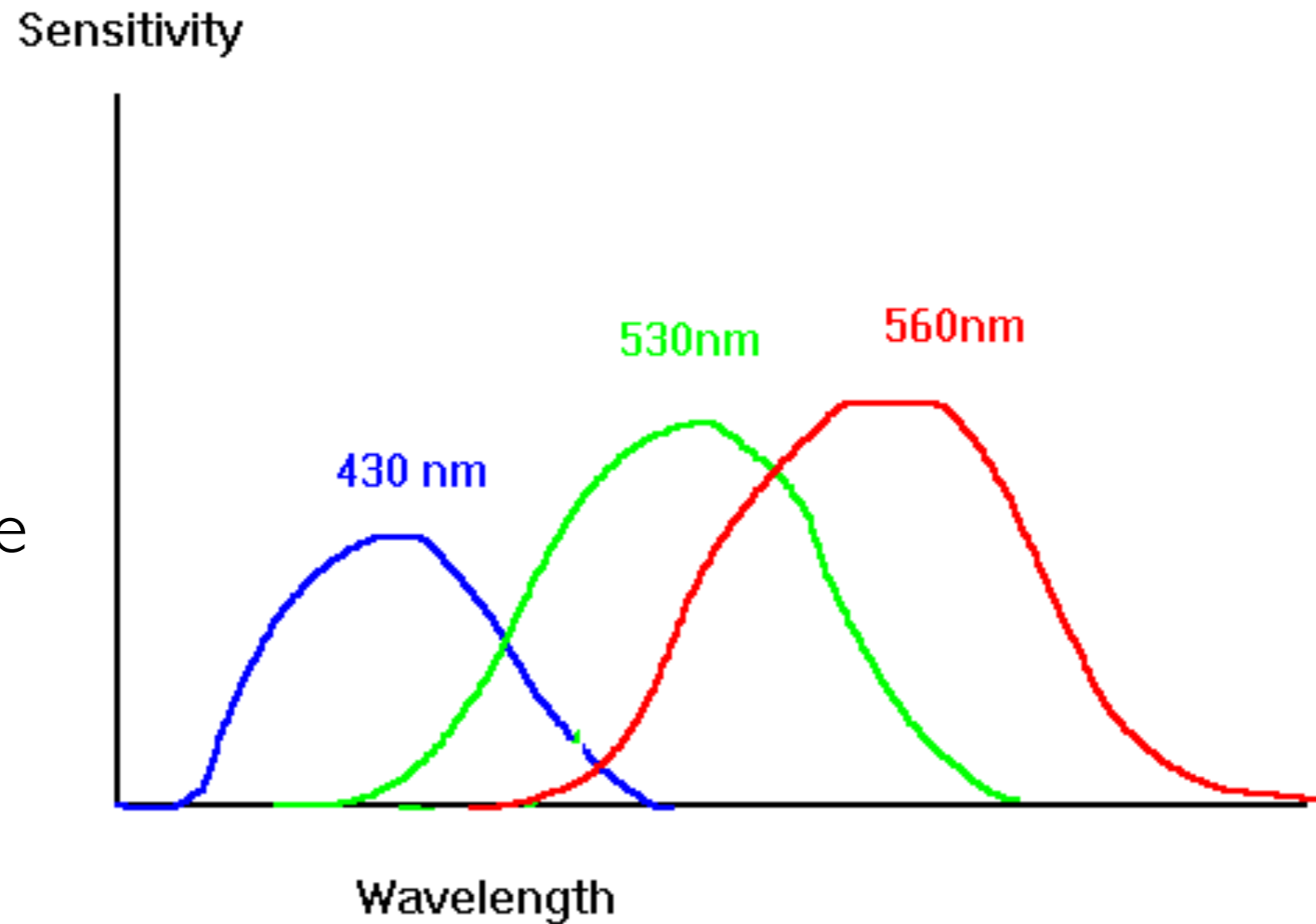
Human abilities

- Humans:
 - Perception
 - Color
 - Patterns (Gestalt principles)
 - Memory
 - Motor
 - Movement speed/precision (Fitt's law)

Every artifact is the way it is because of human morphology or physiology.

Color sensitivity

not as sensitive
to blue!



Color sensitivity

- Not distributed evenly
 - mainly reds (64%) & very few blues (4%)
- No blue cones in retina center
 - “disappearance” of small blue objects you fixate on

Color sensitivity

- Not distributed evenly
 - mainly reds (64%) & very few blues (4%)
- No blue cones in retina center
 - “disappearance” of small blue objects you fixate on

Design implication:

don't rely on blue for text or small objects

Focus

- Different wavelengths of light focused at different distances behind eye's lens
 - need for constant refocusing causes fatigue
- Pure (saturated) colors require more focusing than less pure (desaturated)

Focus

- Different wavelengths of light focused at different distances behind eye's lens
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Design implication:

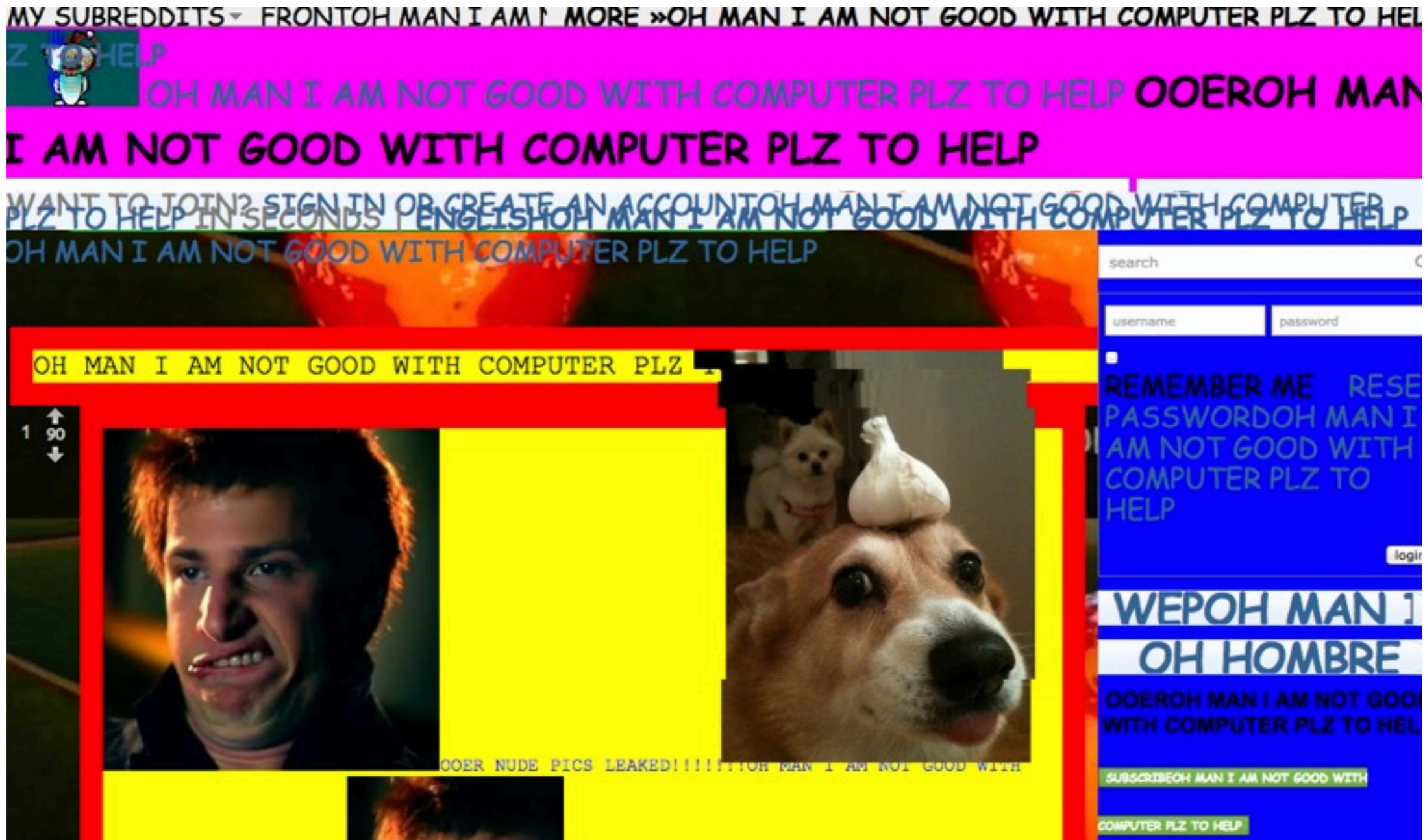
be careful about color combinations

don't use saturated colors in UIs unless you really need something to stand out (stop sign)

Color guidelines

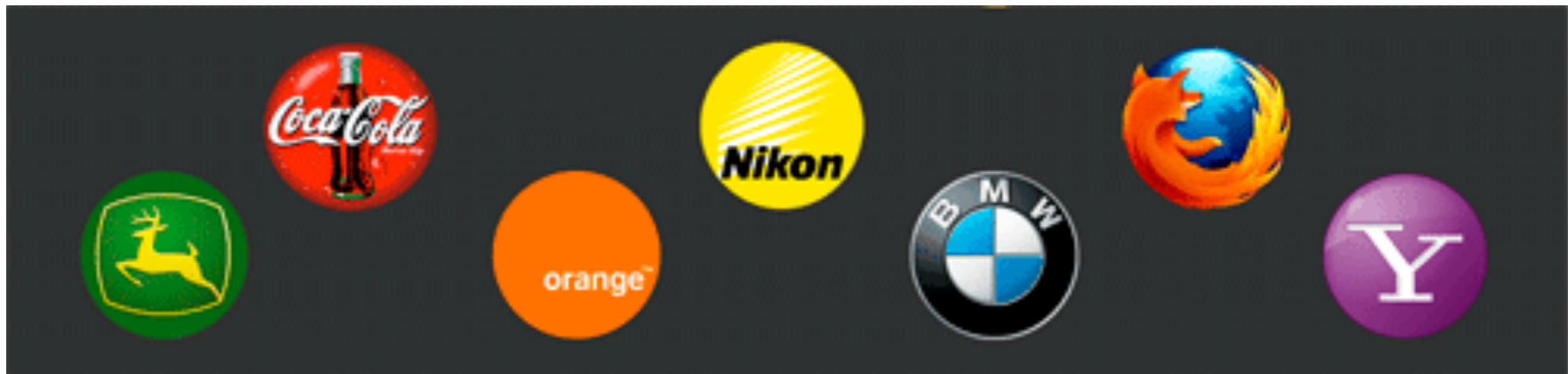
The Falklands Society

Color guidelines



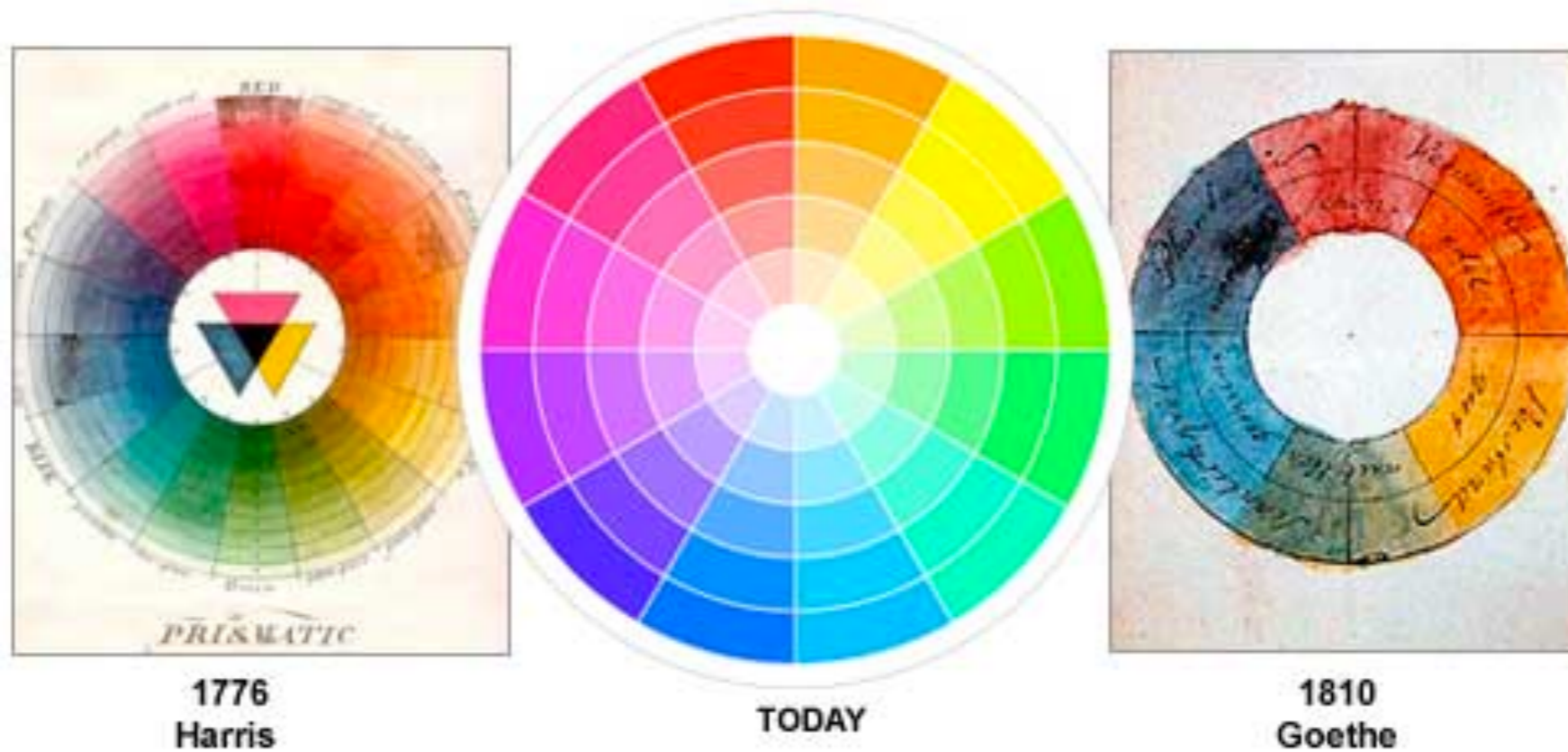
Color guidelines

- Inherent meaning or feeling associated with colors
 - companies exploit it

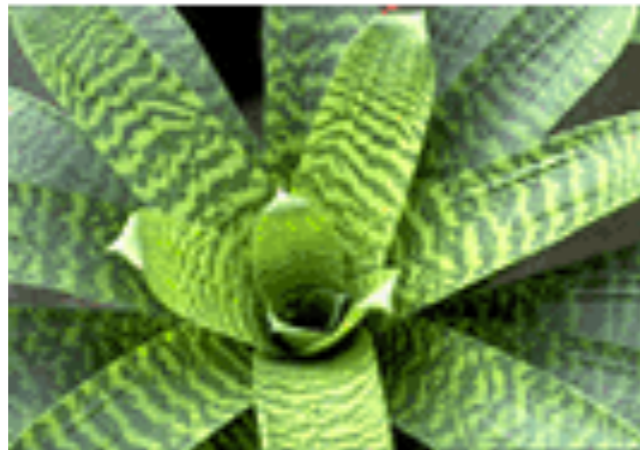


Color guidelines

- The color wheel



Color harmony



©Jill Morton - Color Matters



©Jill Morton - Color Matters



Attention/saliency



Attention/saliency

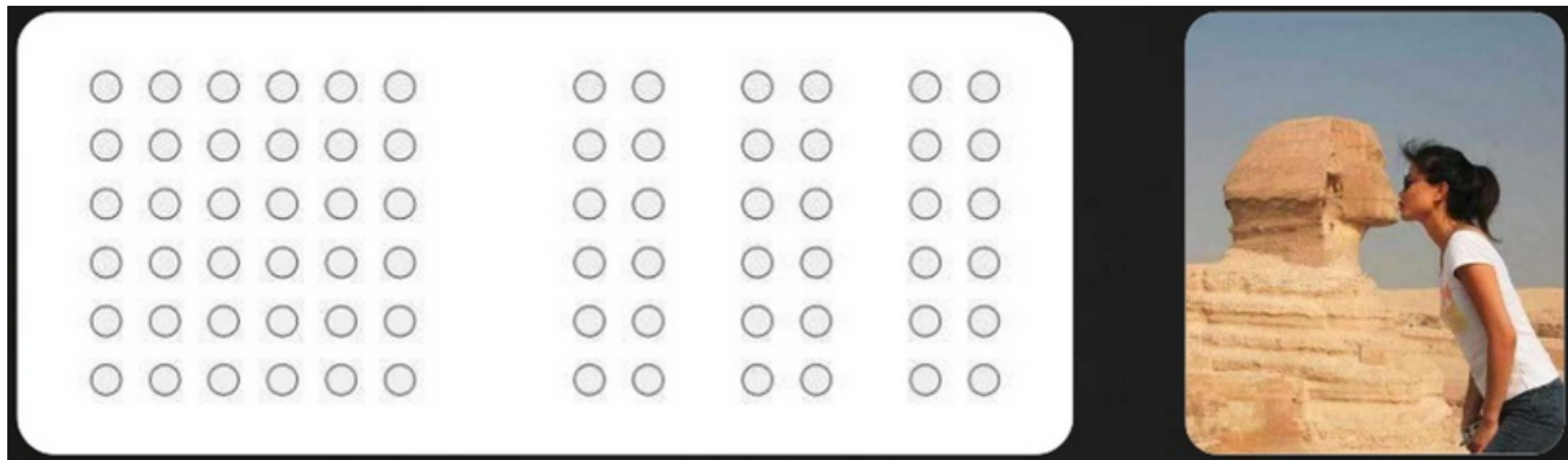


Patterns



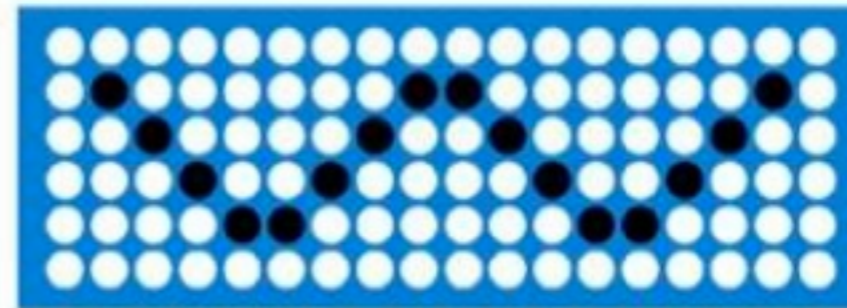
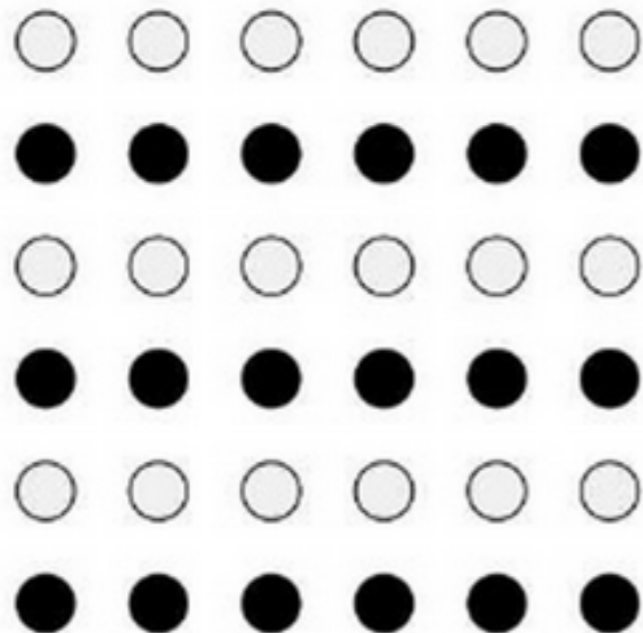
Gestalt principles - proximity

Elements that are **closer together are perceived to be more related** than elements that are farther apart.



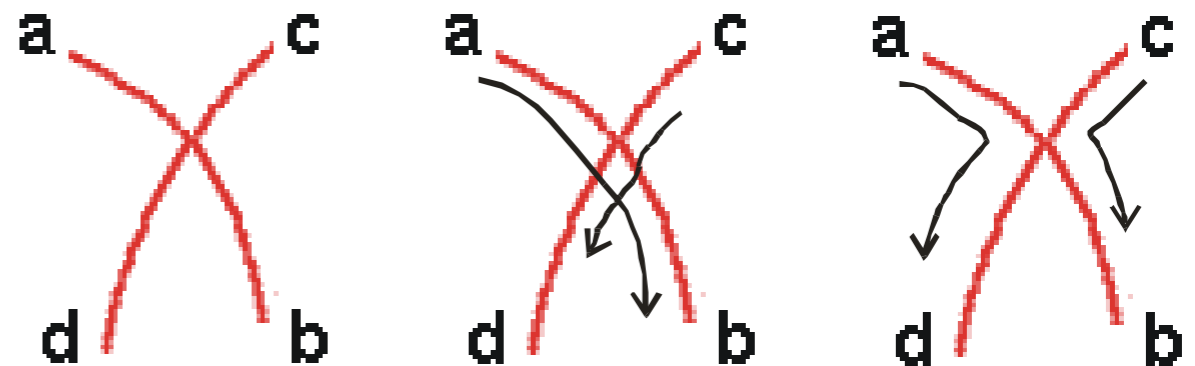
Gestalt principles - similarity

Elements are **similar** are **perceived to be more related** than elements that are dissimilar.



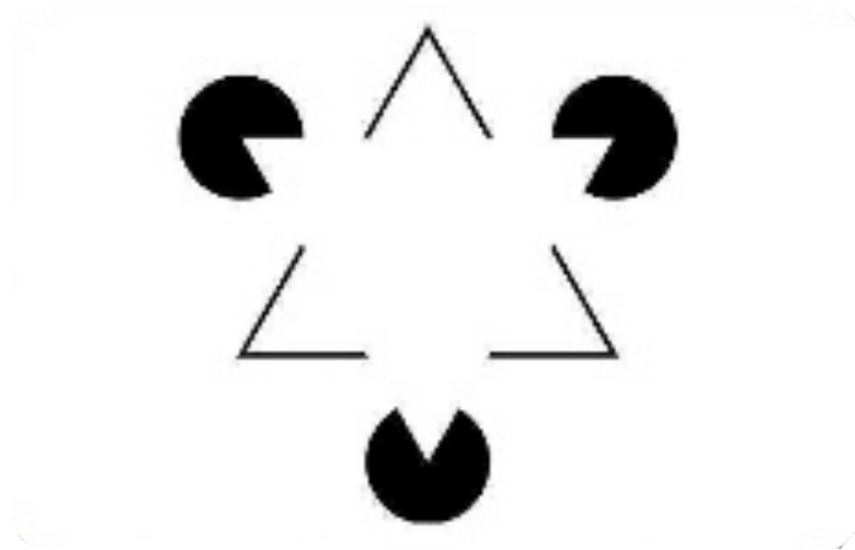
Gestalt principles - good continuation

Elements arranged in a **straight line or a smooth curve** are perceived as a group and are interpreted as being more related than elements not on the line or curve.



Gestalt principles - closure

A tendency to perceive a **set of individual elements as a single, recognizable pattern**, rather than **multiple, individual elements**.



Memory

- Working memory (short term)
 - small capacity (7 ± 2 “chunks”)

Memory

- Access time

Paper

Home

Back

Schedule

Page

Change

Yellow

White

Black

Blue

Red

Green

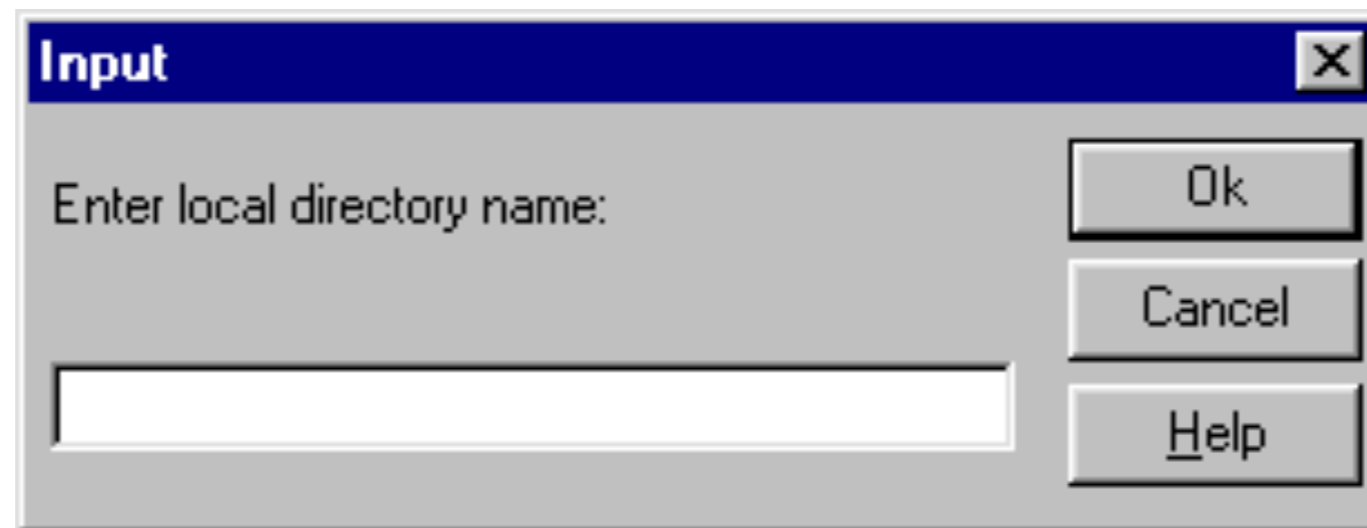
Memory

Recall

reproduce information from memory

Recognition

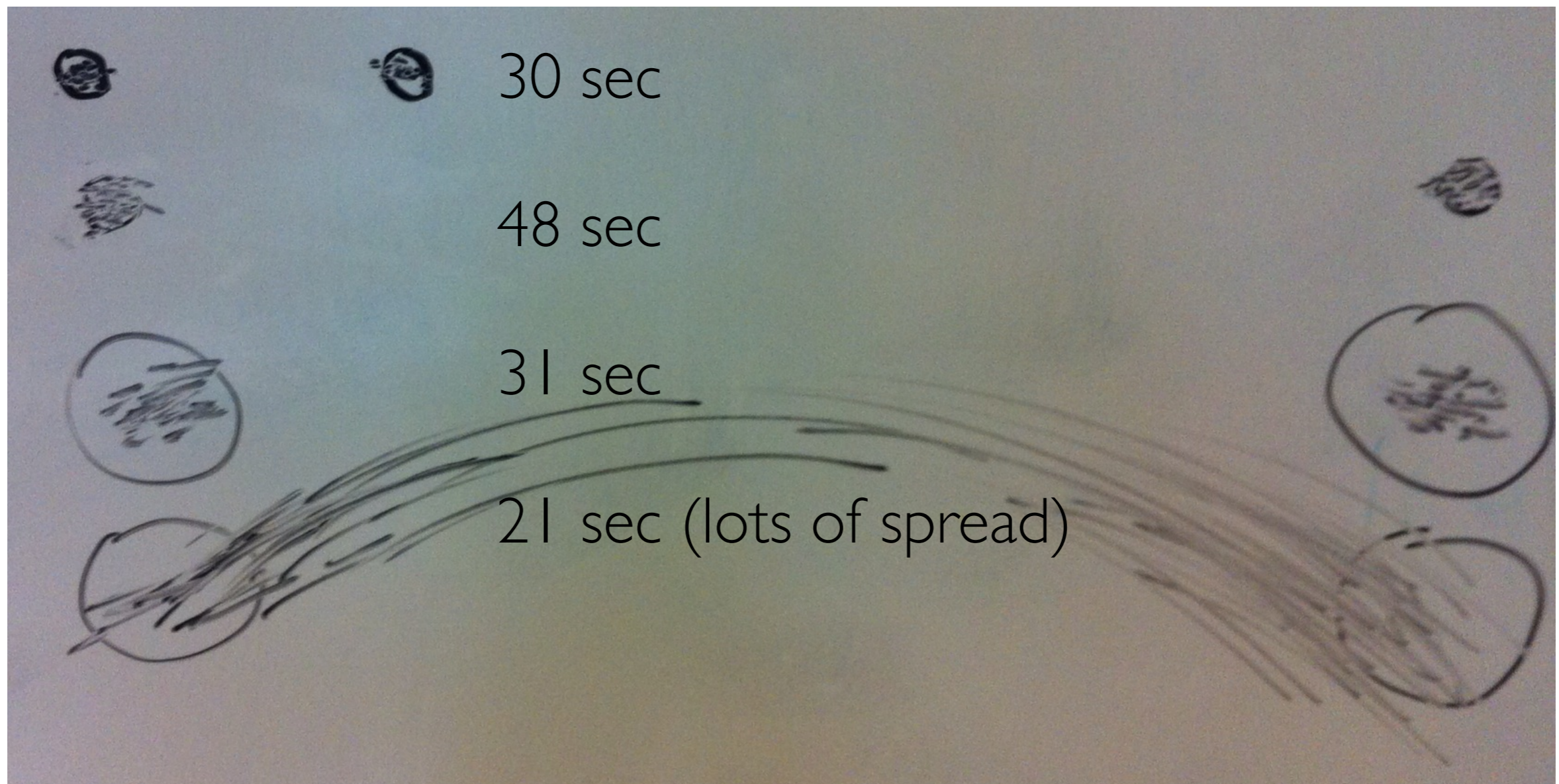
discriminate among provided info



Human motor movements

- Task:
 - Quickly tap each target 50 times accurately
- Conditions:
 - Two $\frac{1}{2}$ " diameter targets 6" apart
 - Two $\frac{1}{2}$ " diameter targets 24" apart
 - Two 2" diameter targets 24" apart
 - Two 2" diameter targets 24" apart (no accuracy required)

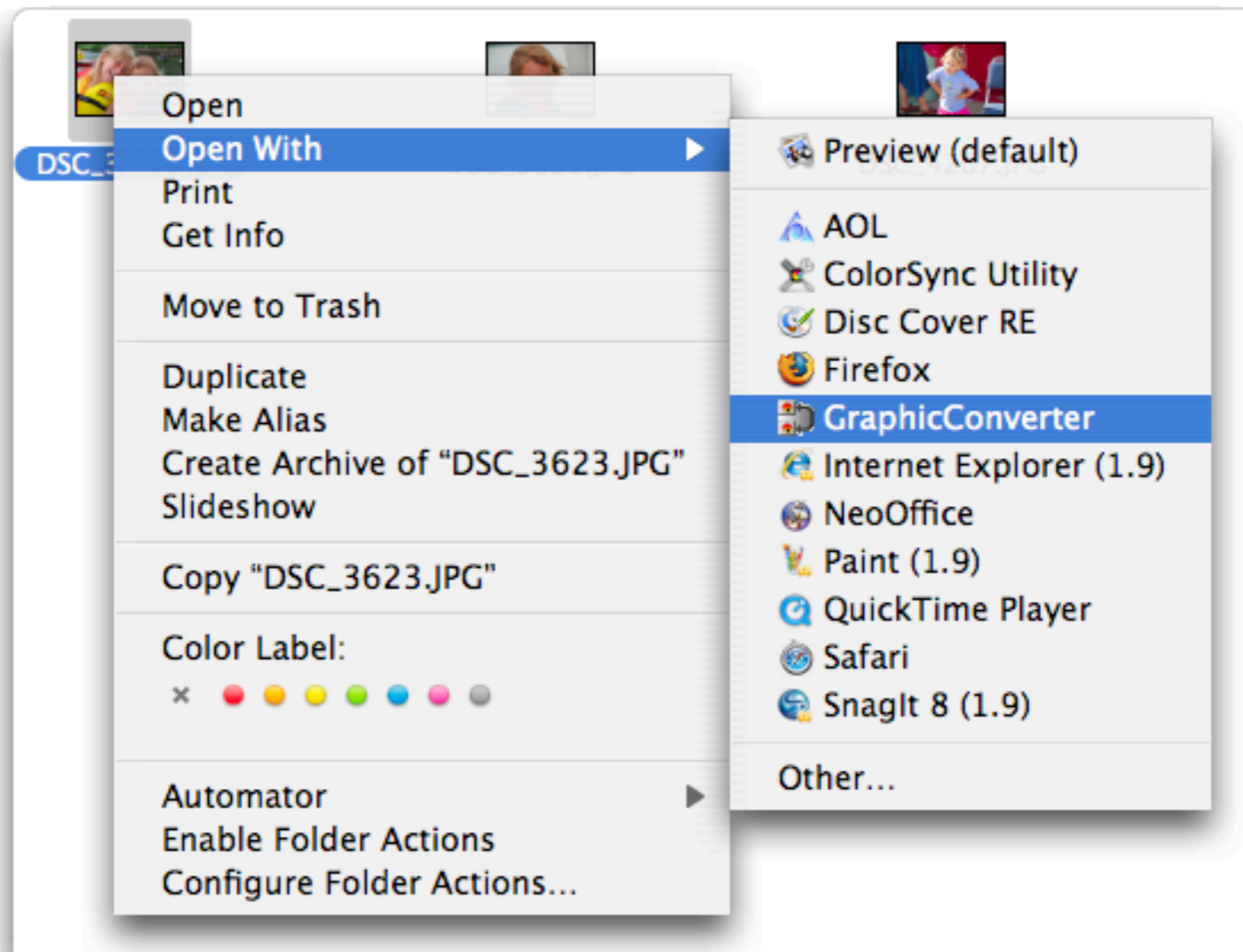
Human motor movements



Fitt's law

- To move the hand/mouse to target size S which is distance D away is given by:
 - $T = a + b \log_2 (D/S + 1)$
- D/S : relative precision

Fitt's law

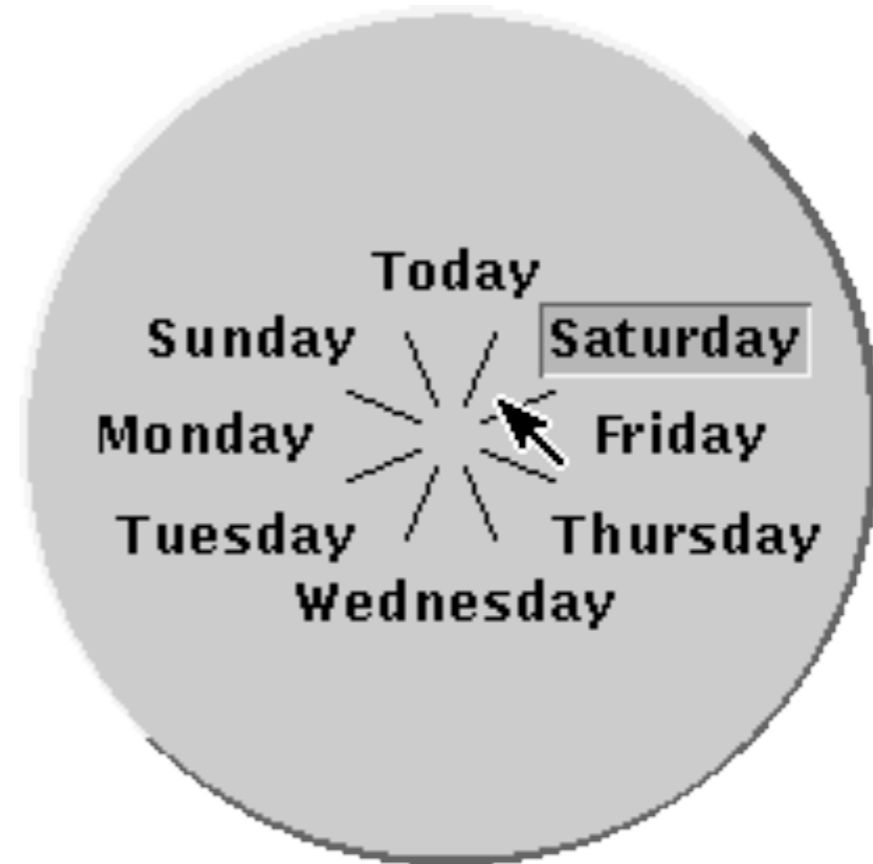


Fitt's law

Which one is faster on average?

Today
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday

Pop-up Linear Menu



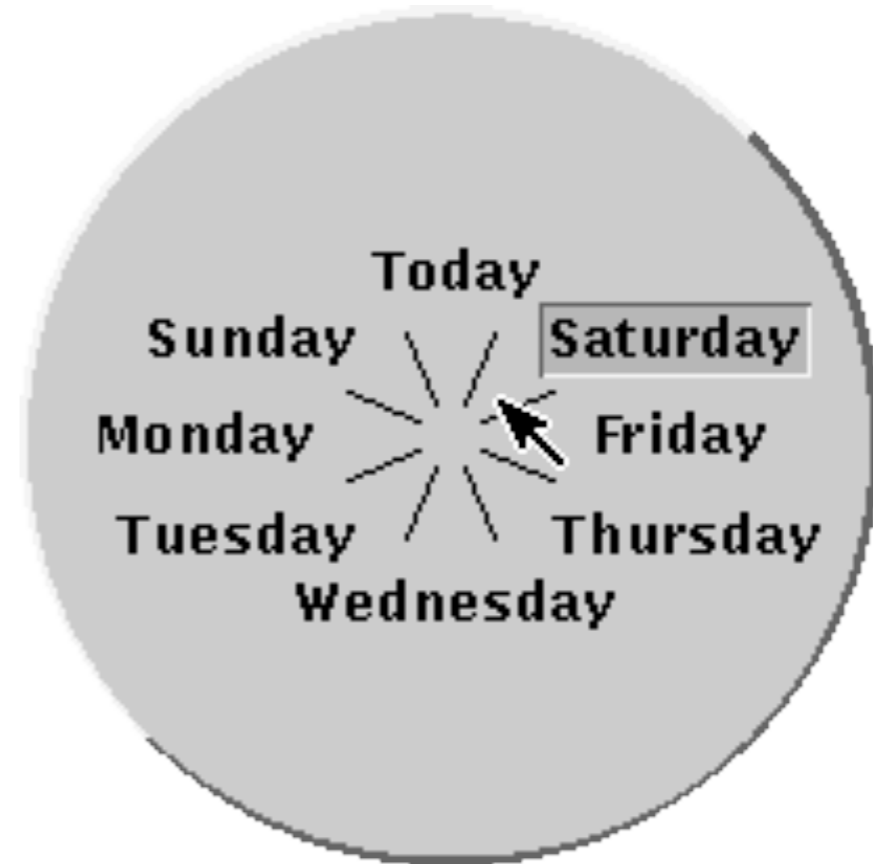
Pop-up Pie Menu

Fitt's law

Which one is faster on average?

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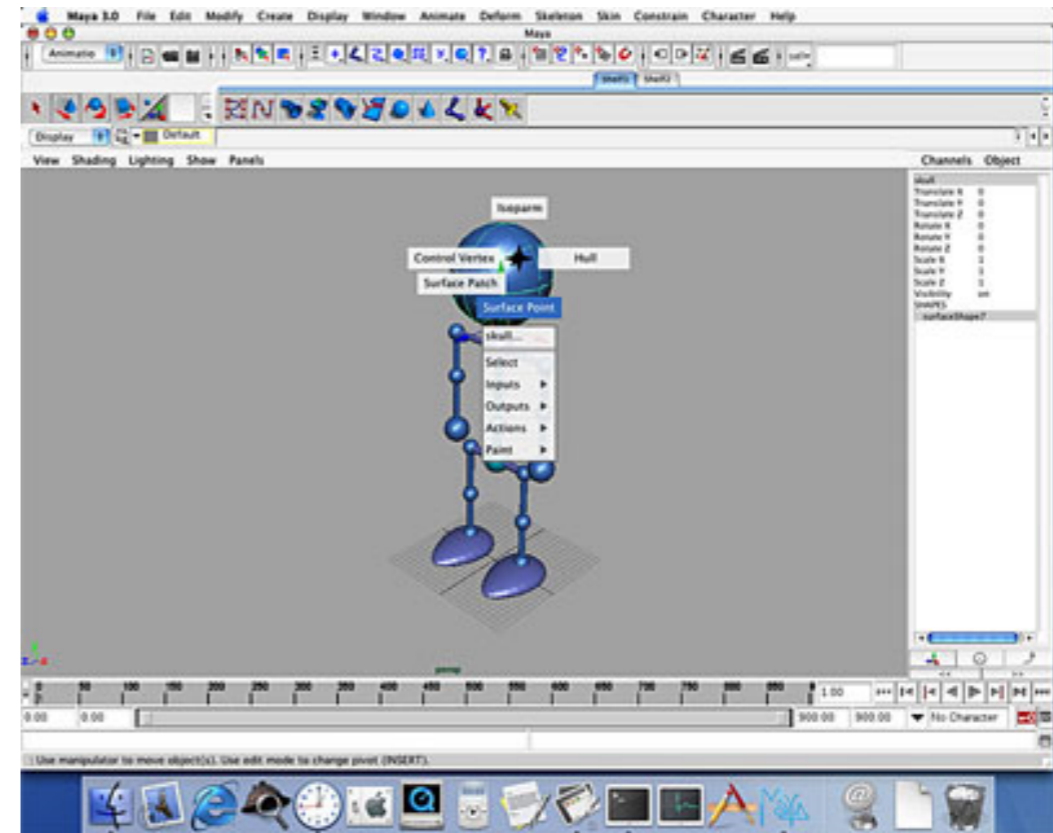
Pop-up Linear Menu



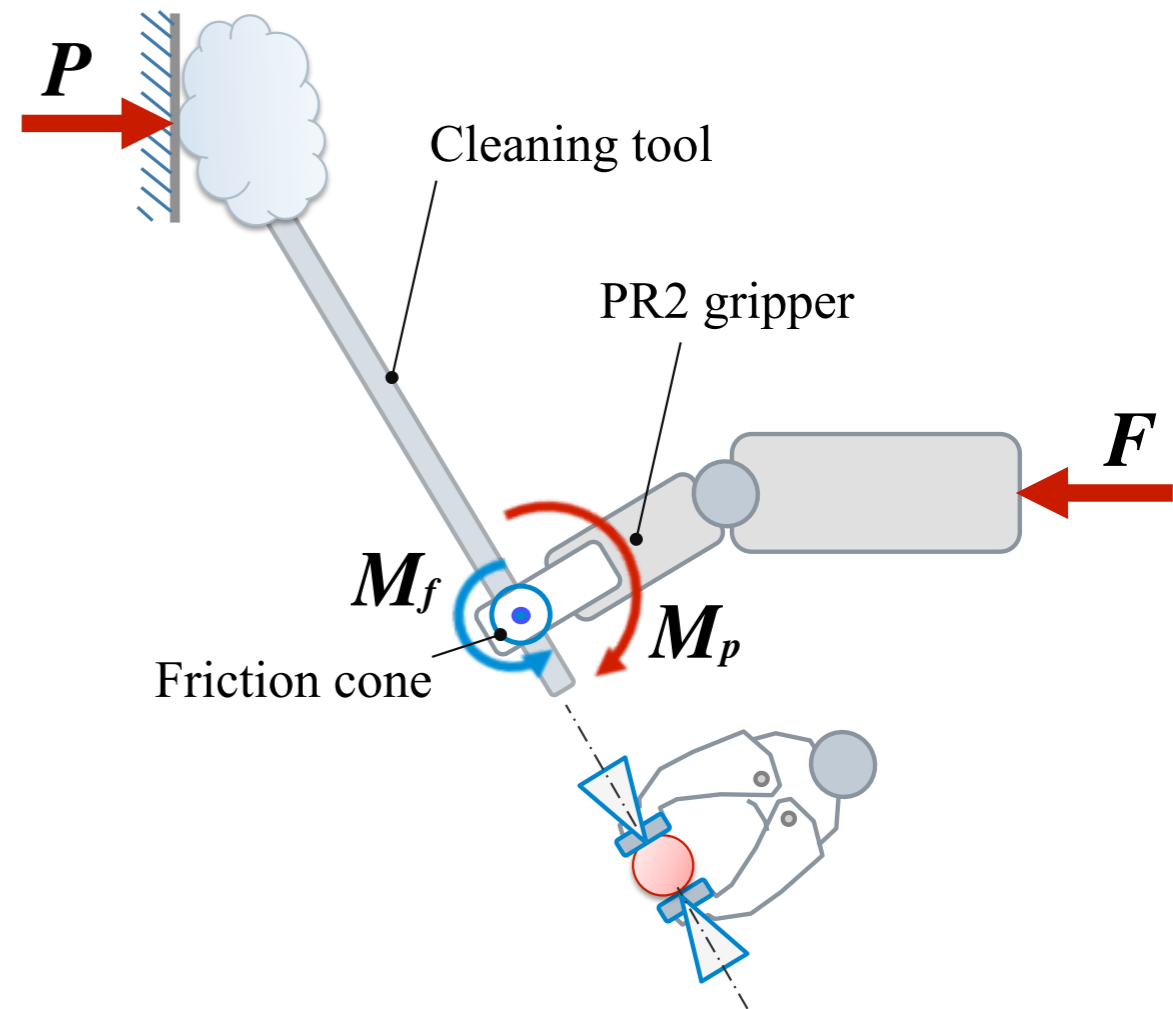
Pop-up Pie Menu

bigger targets & less distance

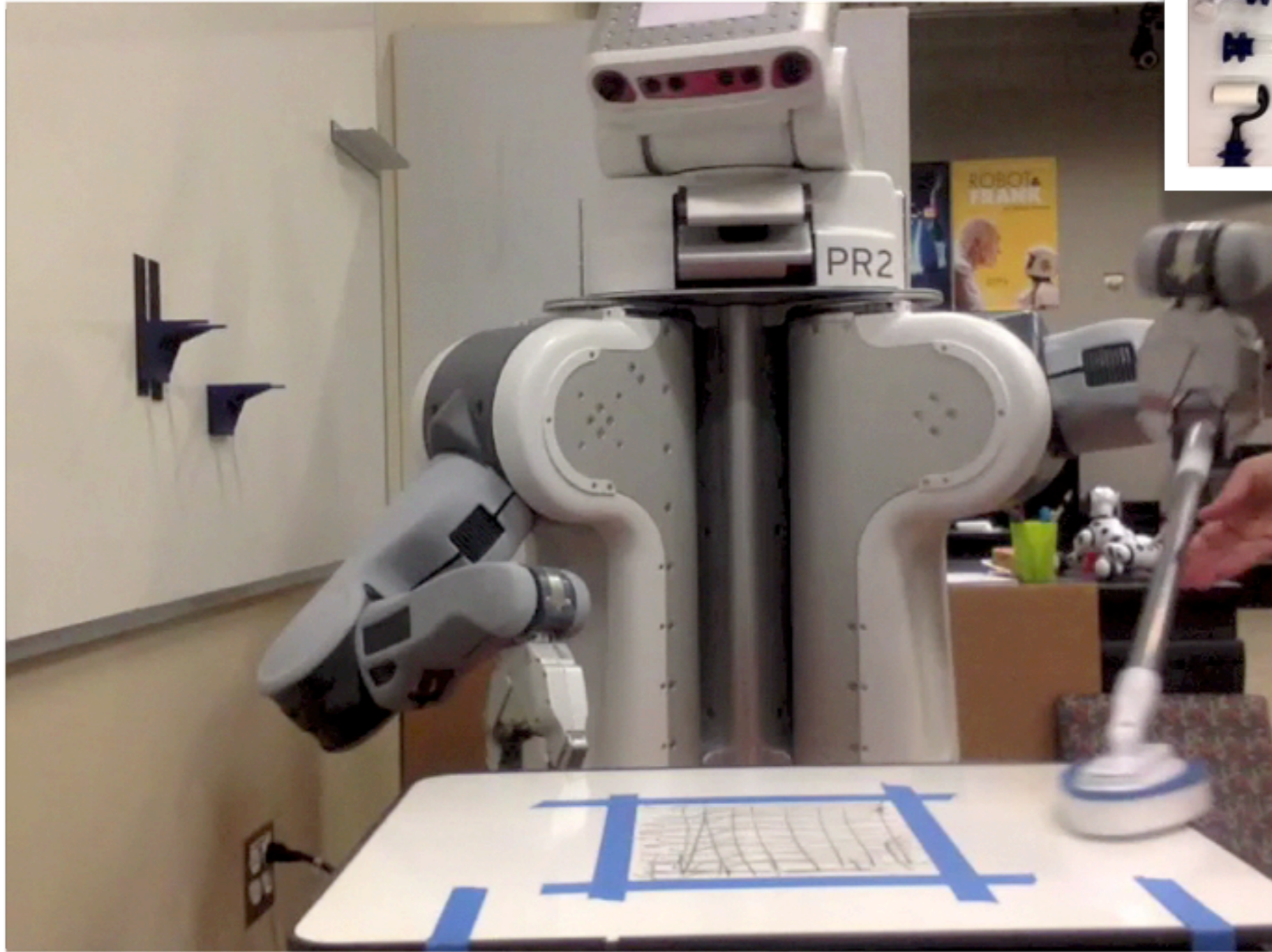
Pop up pie menu



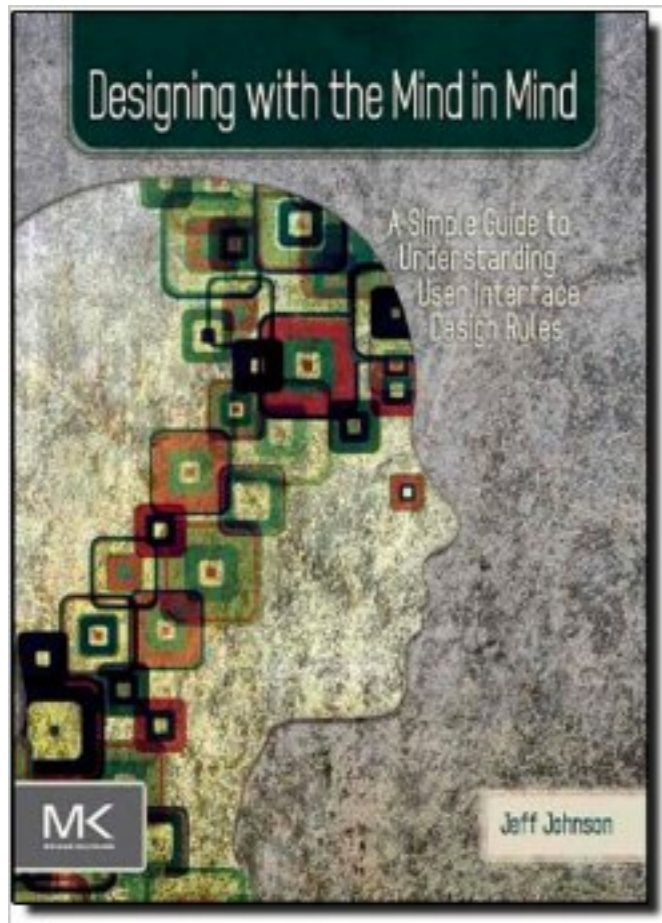
Human versus Robot Factors



Human versus Robot Factors



Human limitations



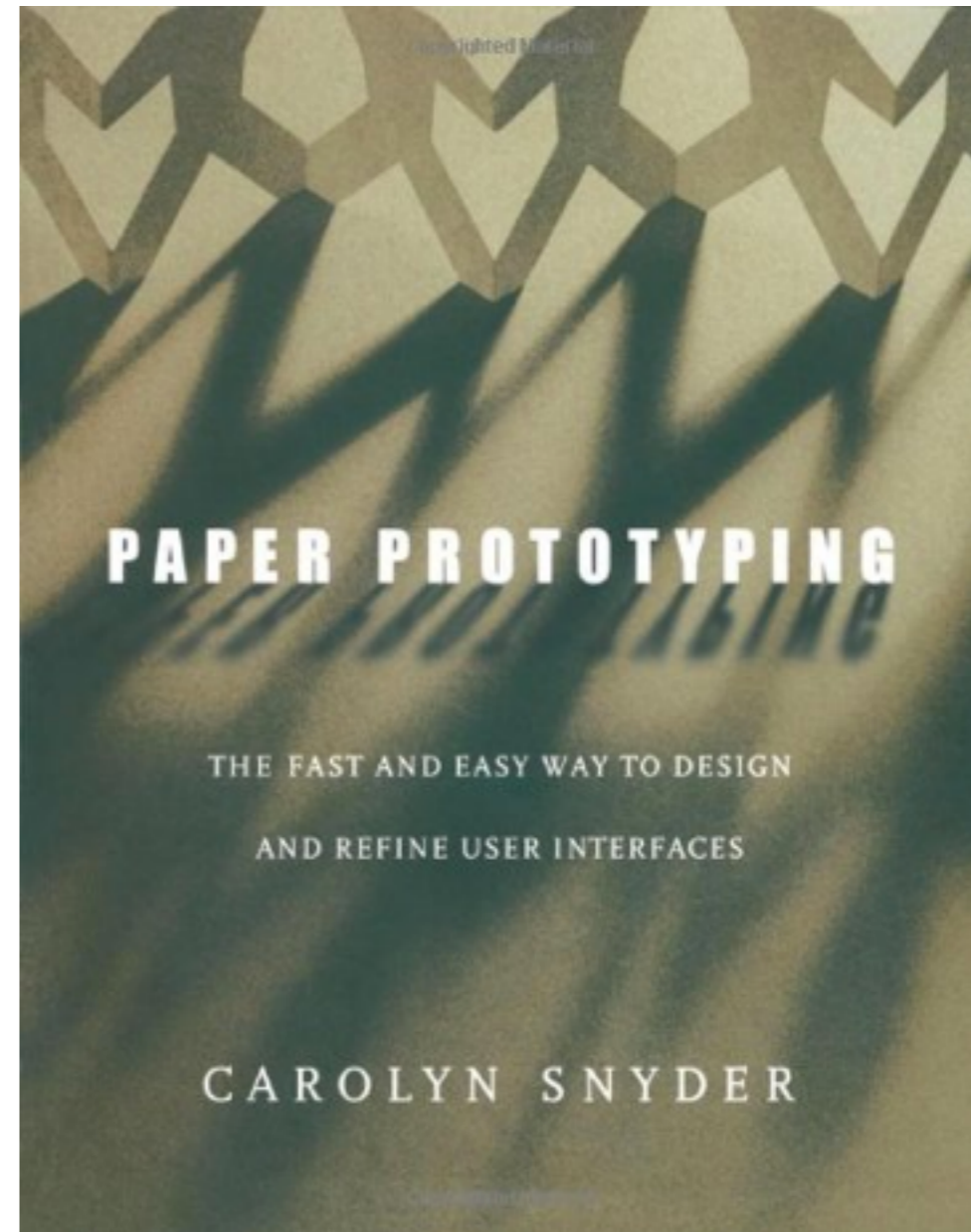
- We perceive what we expect
- Our Vision is Optimized to See Structure
- We Seek and Use Visual Structure
- Reading is Unnatural
- Our Color Vision is Limited
- Our Peripheral Vision is Poor
- Our Attention is Limited; Our Memory is Imperfect
- Limits on Attention, Shape, Thought and Action
- Recognition is Easy; Recall is Hard
- Learning from Experience and Performing Learned Actions are Easy; Problem Solving and Calculation are Hard
- Many Factors Affect Learning
- We Have Time Requirements

PAPER PROTOTYPING



Paper prototyping

- Back to kindergarden
 - Arts and craft
 - Make believe



Prototype fidelity

Fidelity



...

Digital mockups

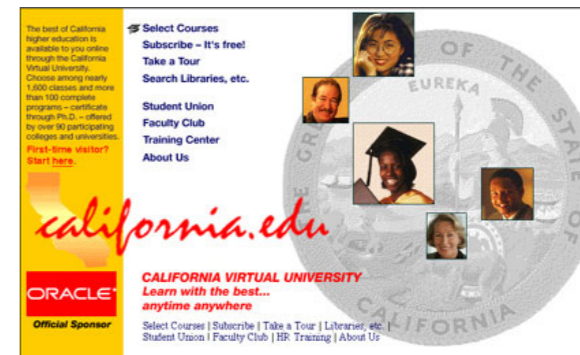
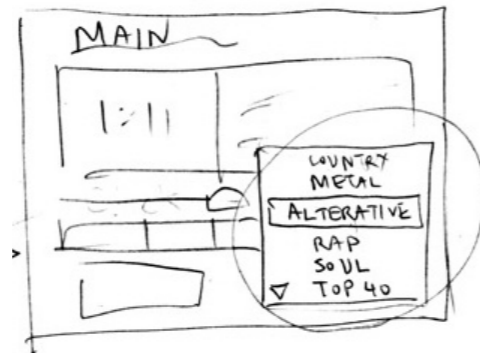
*Paper prototypes****

Storyboarding

Time

Prototype fidelity

Fidelity



...

Digital mockups

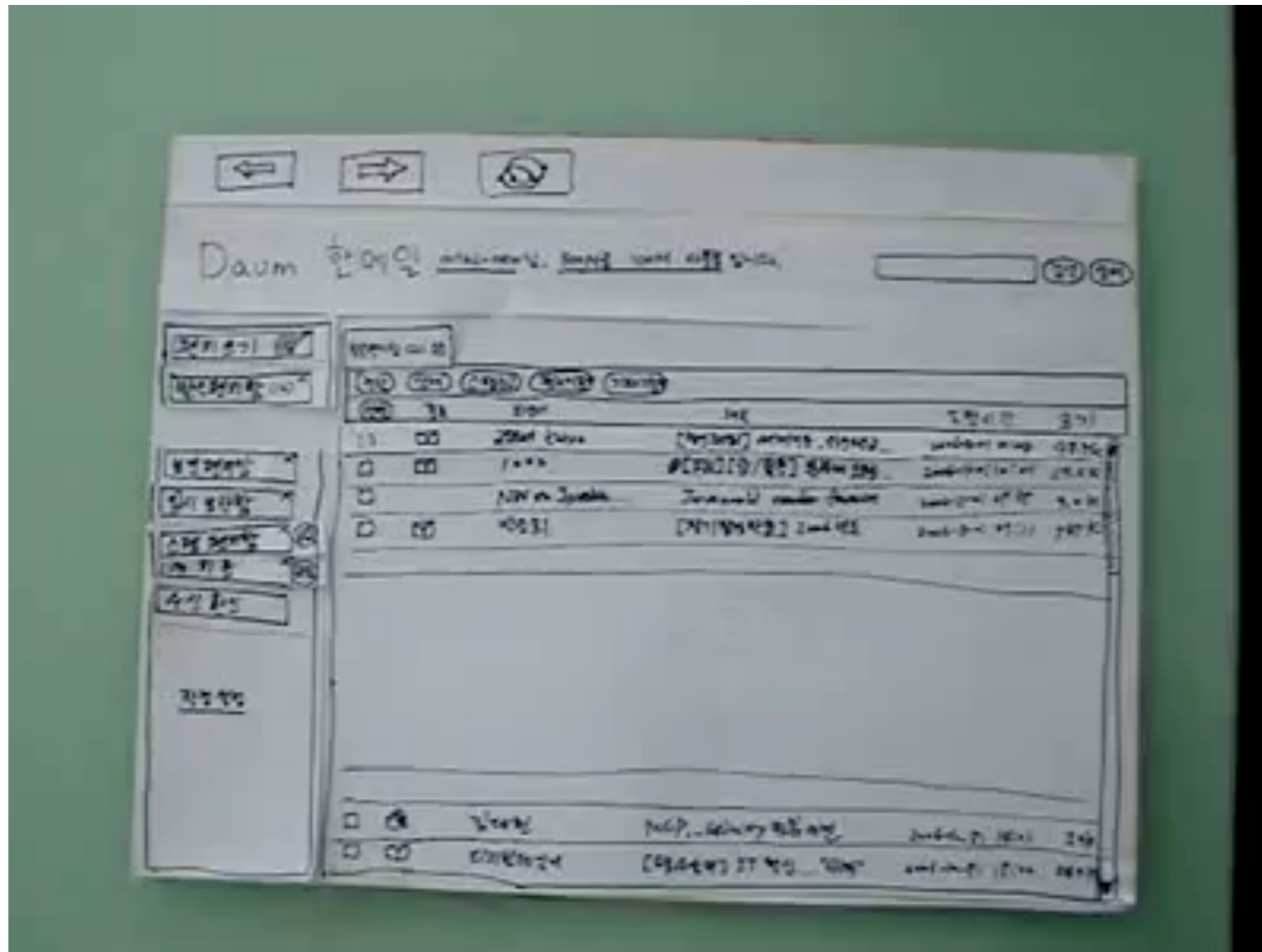
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Storyboarding

Time

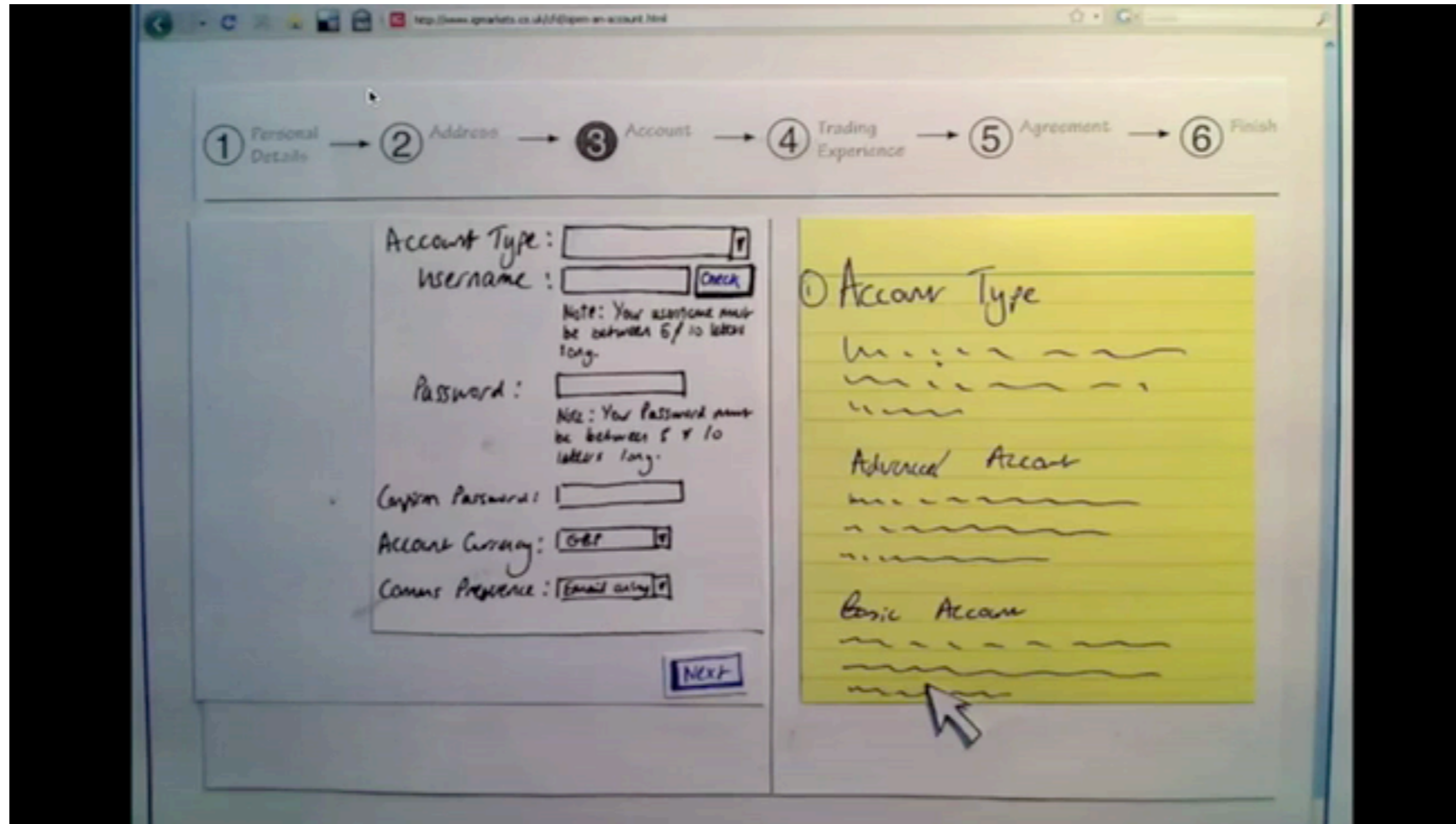
Example 1

Example 1



Example 2

Example 2



What to use?

- Paper: Large, heavy, white
- Index cards
- Post-its
- Tape, stick glue, correction tape
- Pens & markers (many colors & sizes)
- Overhead transparencies
- Scissors, X-Acto knives, etc.

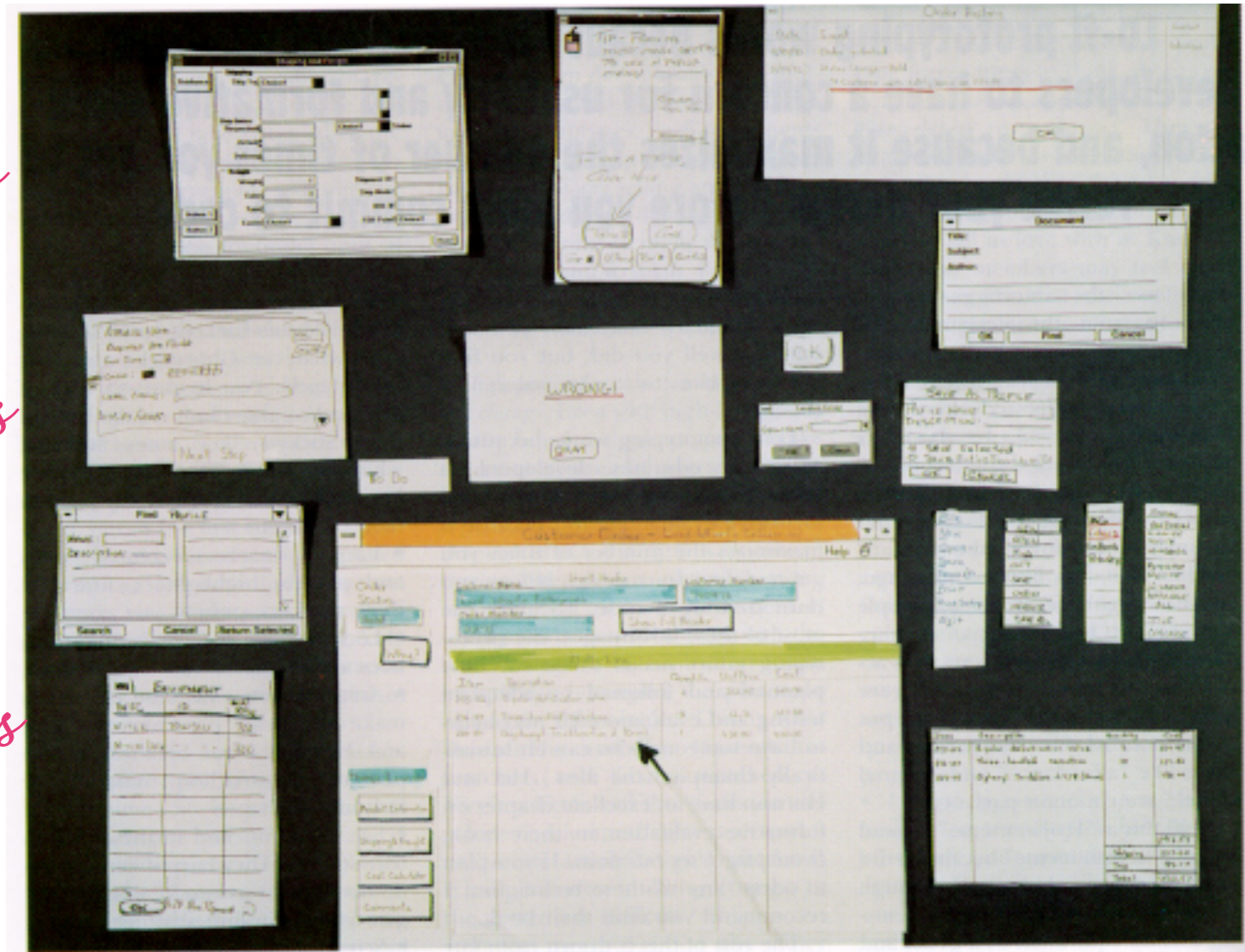


What to make?

*scroll
menus*

text fields

*error
messages*

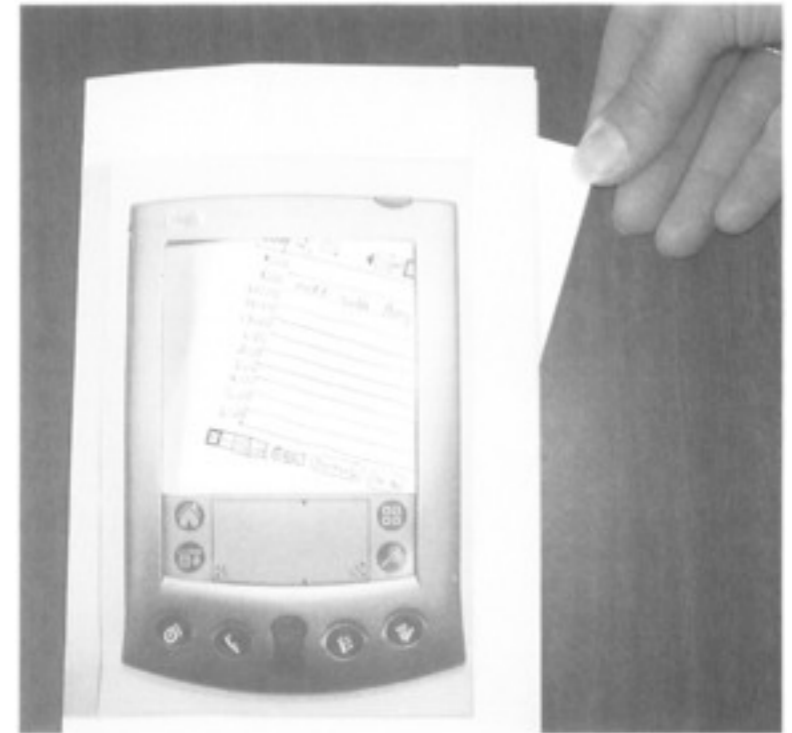


buttons

*drop
down
menus*

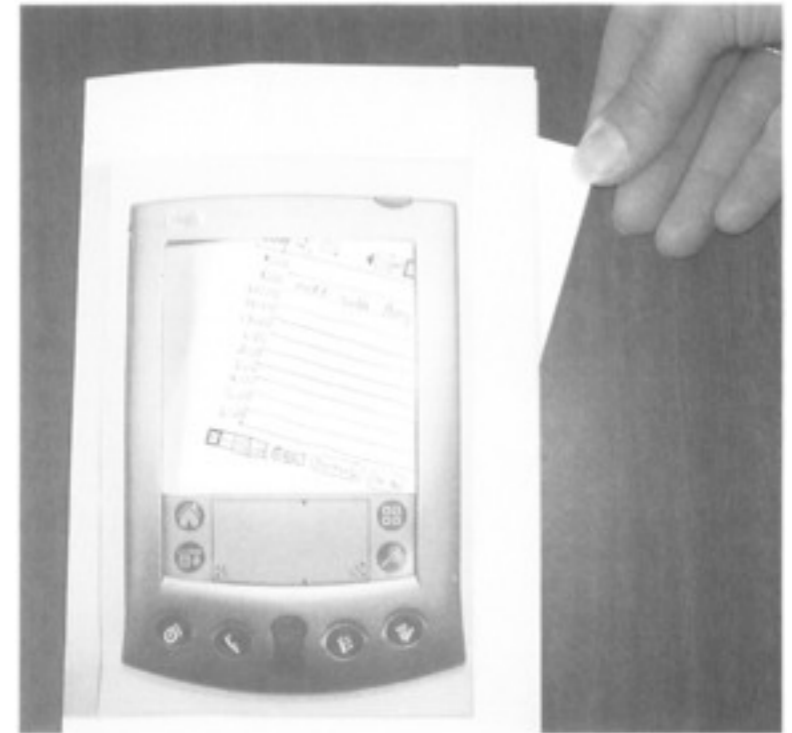
cursor

Tricks



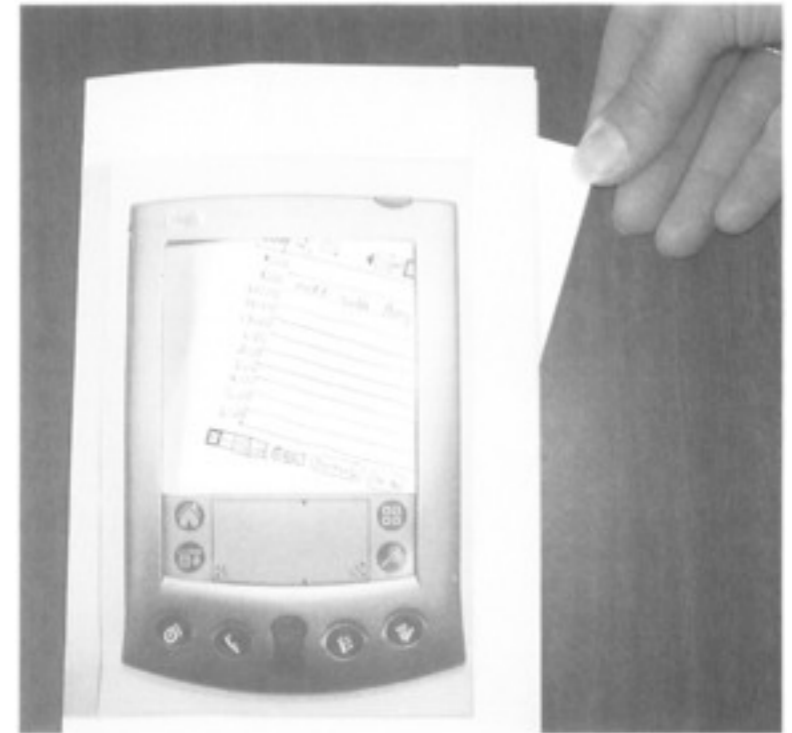
Tricks

- Photocopy repeated items



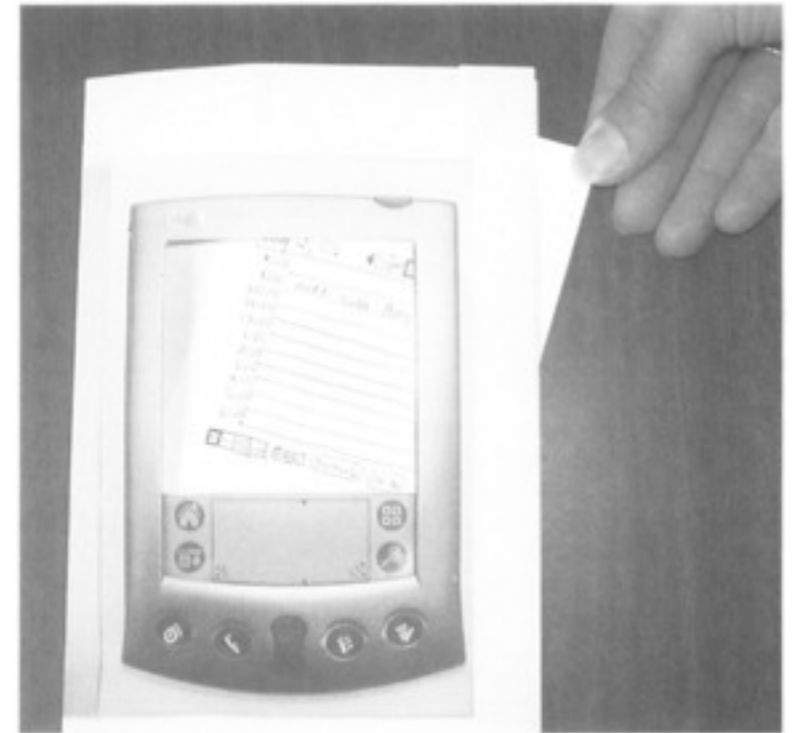
Tricks

- Photocopy repeated items
- 3D sketching for buttons



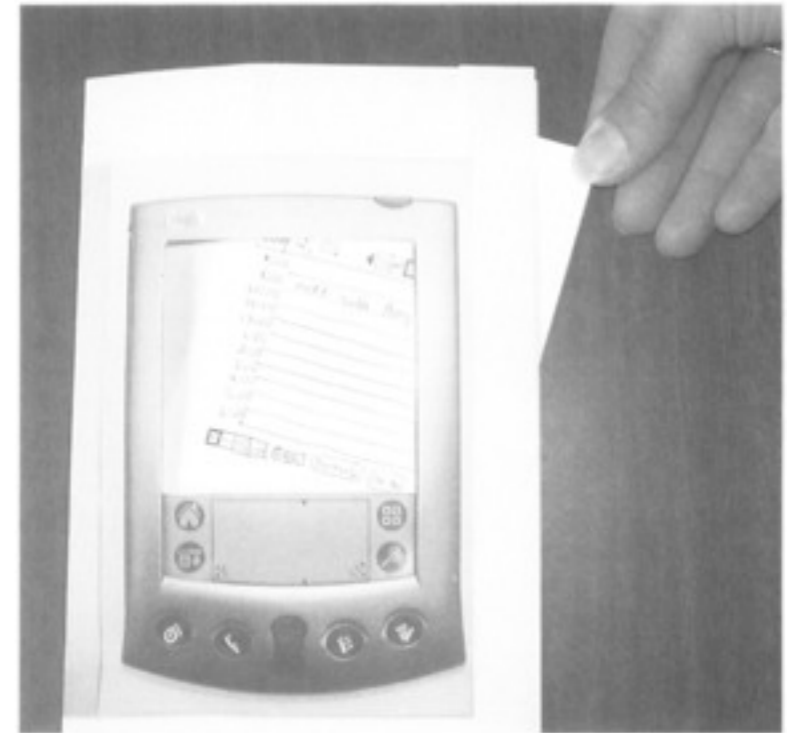
Tricks

- Photocopy repeated items
- 3D sketching for buttons
- Use physical props (stick a paper on your smart phone)



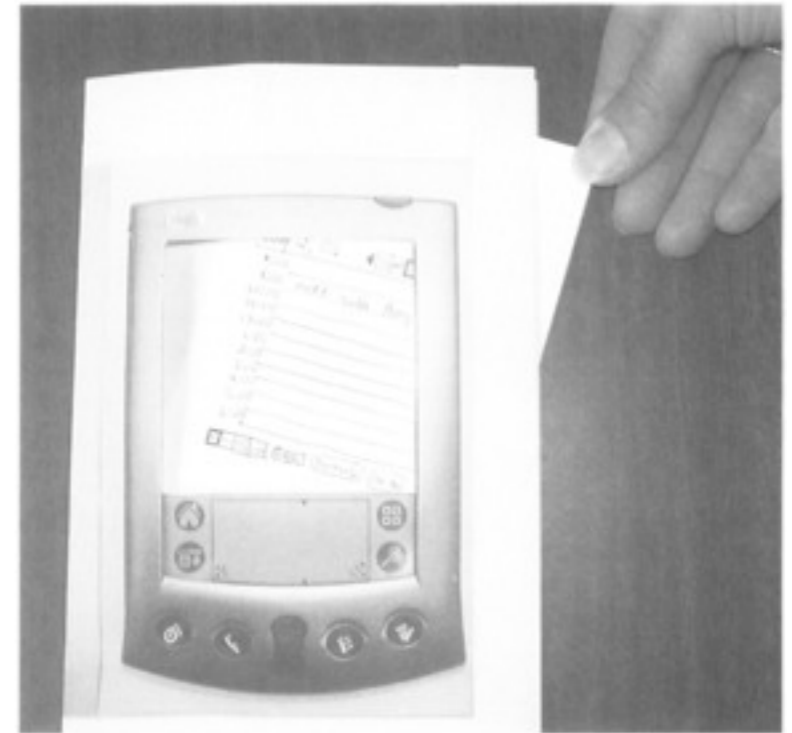
Tricks

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- 3D sketching for buttons
- Use physical props (stick a paper on your smart phone)
- Use real size templates



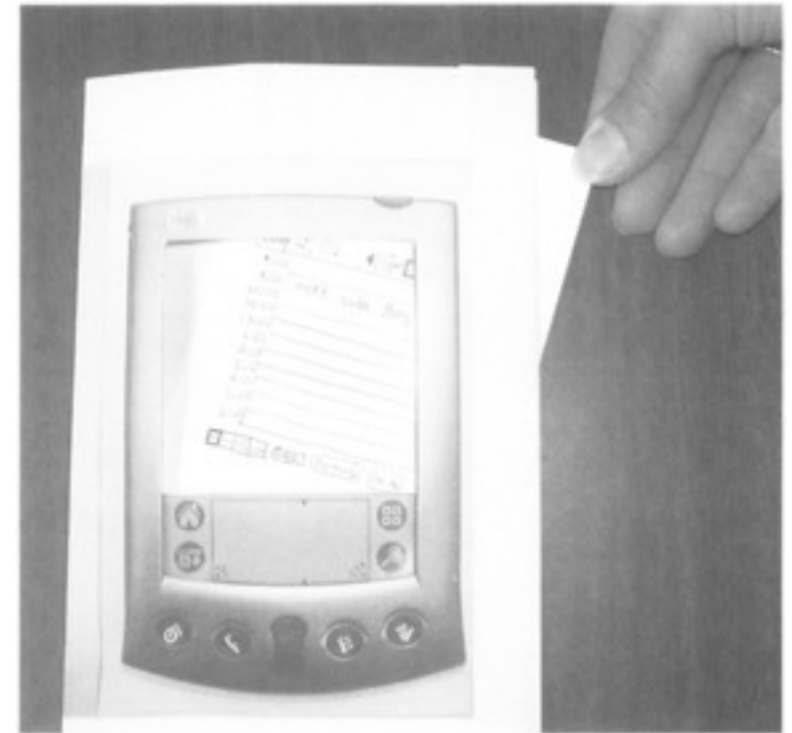
Tricks

- Photocopy repeated items
- 3D sketching for buttons
- Use physical props (stick a paper on your smart phone)
- Use real size templates
- Scroll using a frame



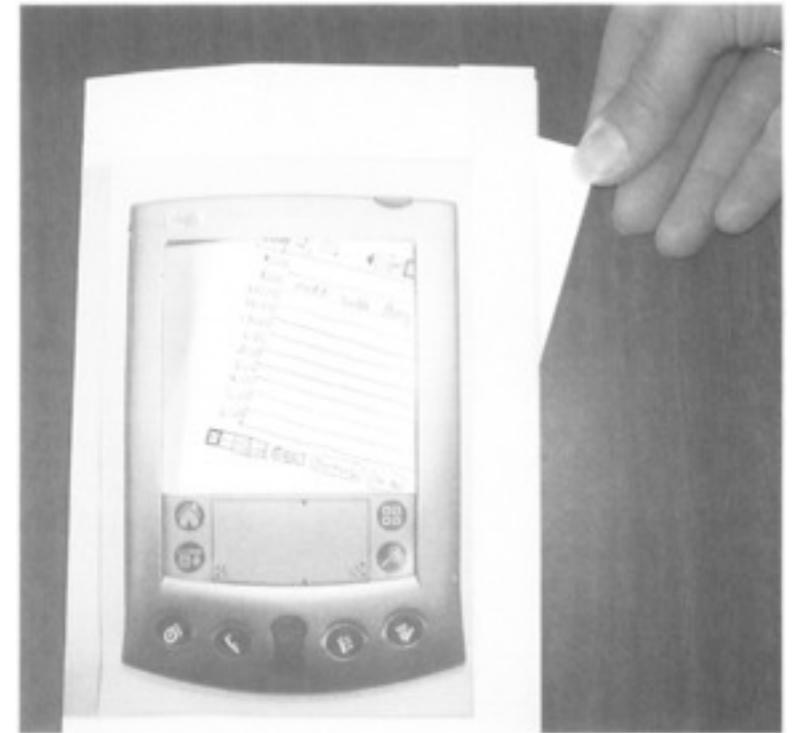
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- 3D sketching for buttons
- Use physical props (stick a paper on your smart phone)
- Use real size templates
- Scroll using a frame
- Transparencies for adding text



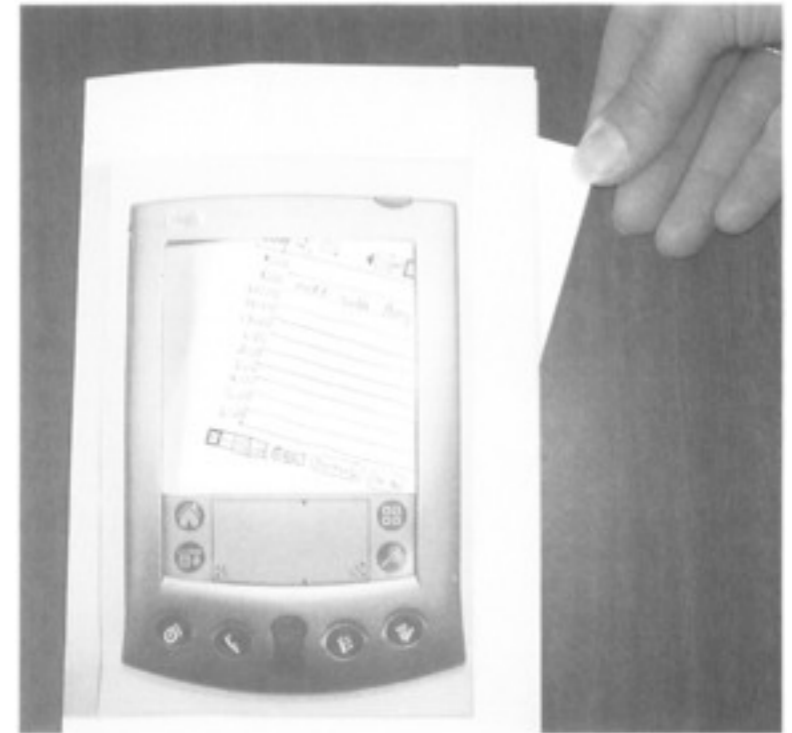
Tricks

- Photocopy repeated items
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- Use physical props (stick a paper on your smart phone)
- Use real size templates
- Scroll using a frame
- Transparencies for adding text
- Folding (hide/expand)



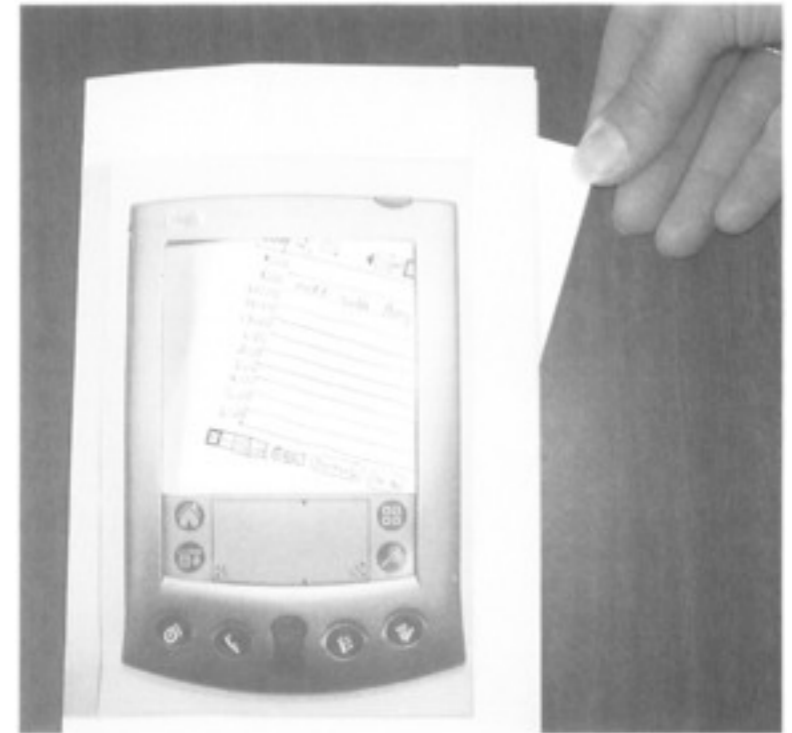
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- Verbal help menu/tool tip



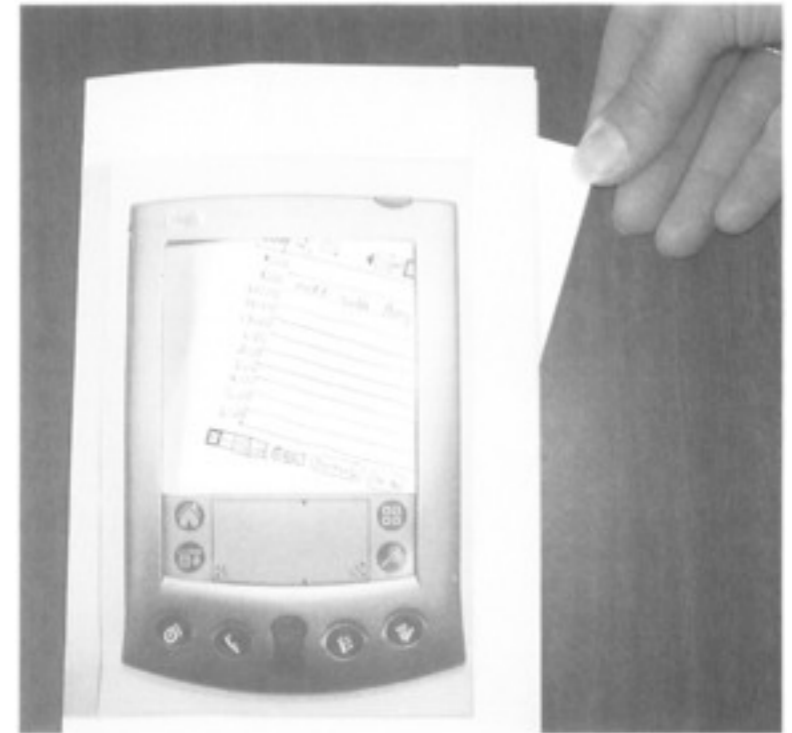
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- Use sounds (beep)



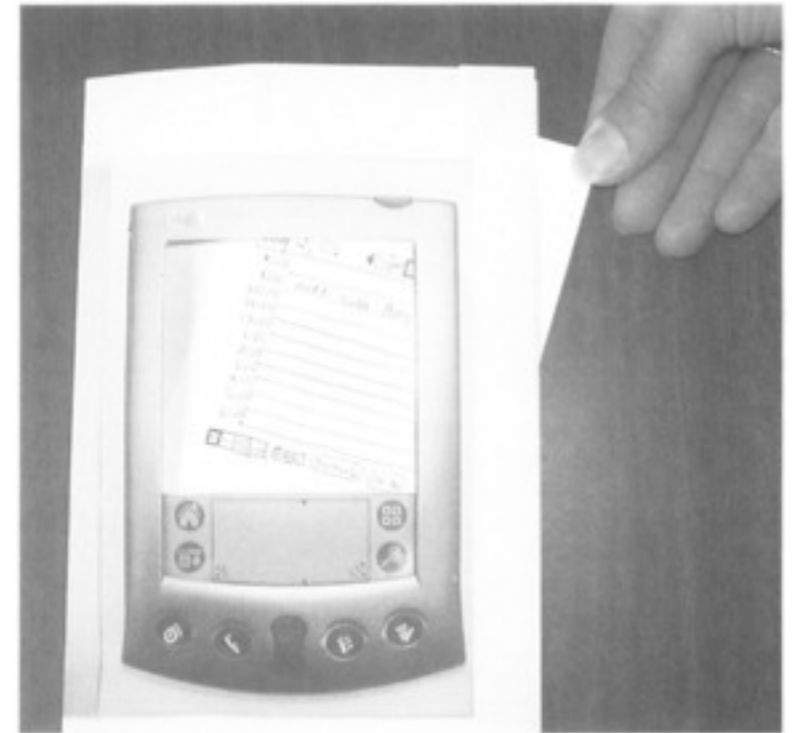
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- User real images



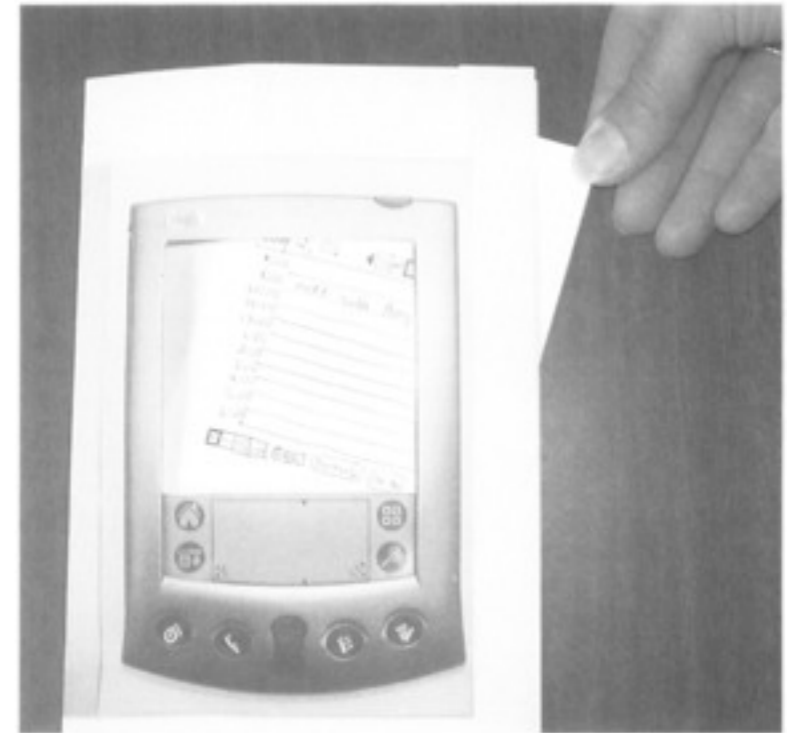
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- User real images
- Use familiar OS icons



Tricks

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- User real images
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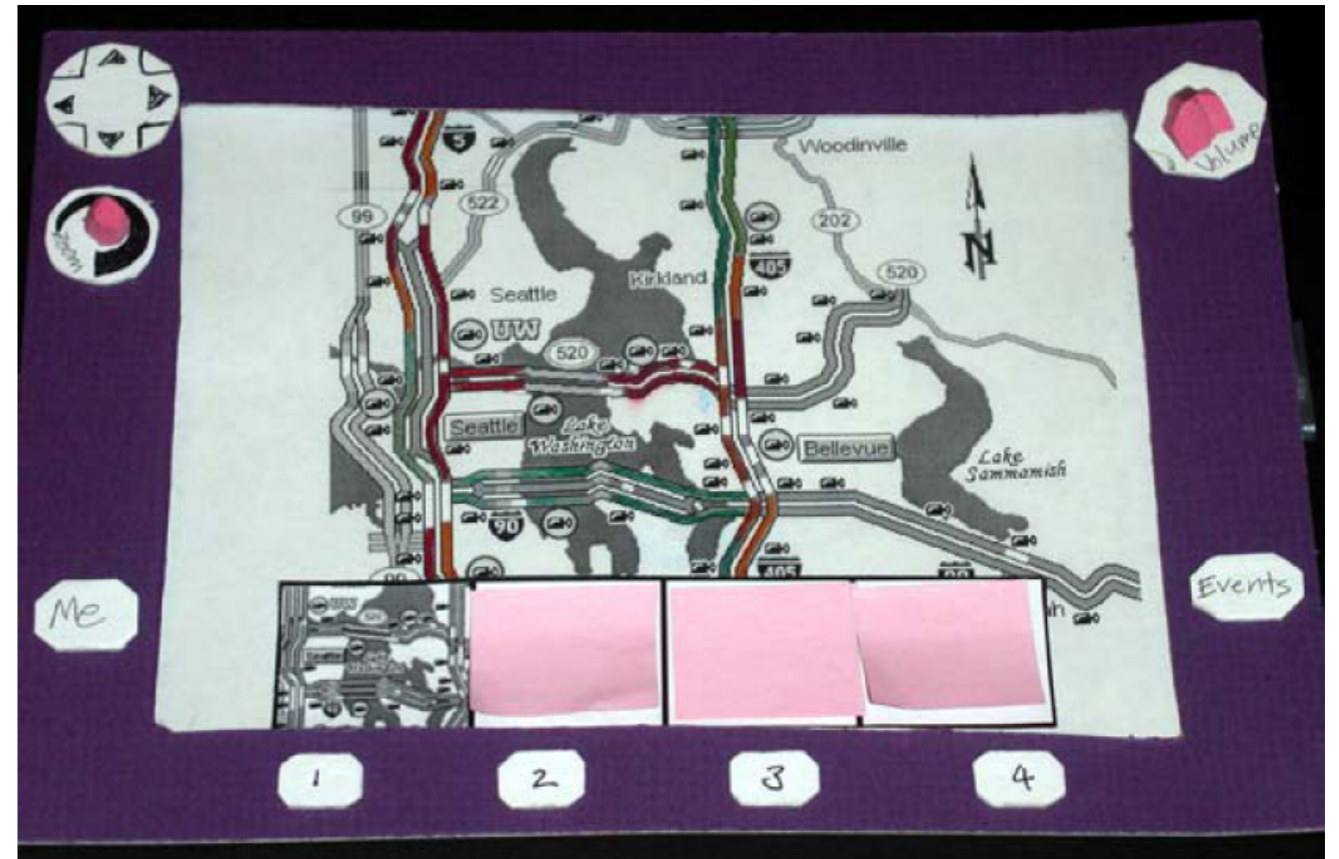


Invent your own tricks!

Example: Physical prop



Example: Scrolling, use of real imagery

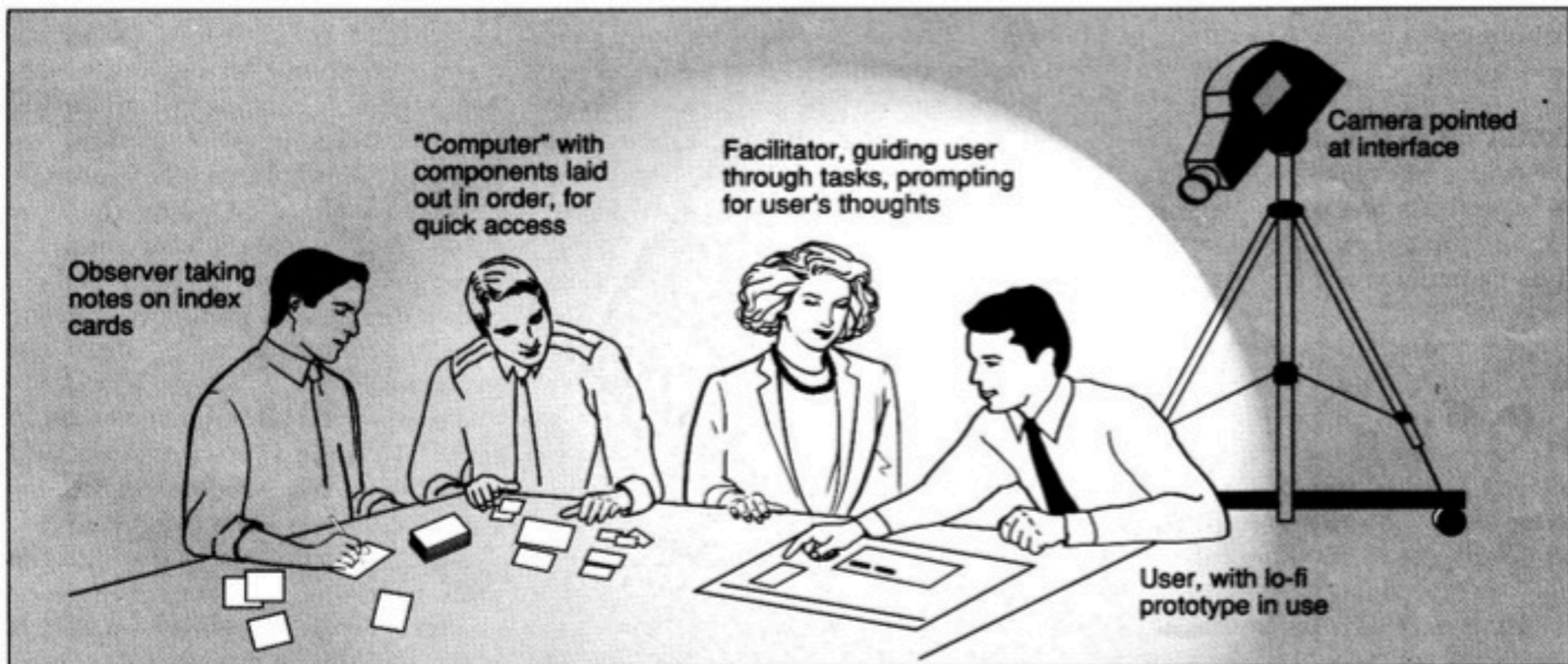


Time limit

- Important! Just as in storyboards

Testing a prototype

- Prepare test scenarios
- Practice
- Lay out or order pieces



Problems with lo-fi prototypes

Problems with lo-fi prototypes

- “Computer” is inherently buggy
- Slow compared to real app
 - timings not accurate
- Hard to implement some functionality
 - pulldowns, feedback, drag, visualizations
- Won't look like final product
 - sometimes hard to recognize widgets
- End-users can't use by themselves
 - not in their actual context of use

Exercise

- Build a paper prototype for an alarm clock
- Support the following tasks:
 - Setting the clock time
 - Setting up an alarm
 - Snoozing (when the alarm goes off)
 - Turning the alarm off